USER'S MANUAL

STANDBY GENERATOR SETS

GESAN

STANDBY GENERATOR SET

GESAN

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1.- WELCOME

Thank you for choosing a GESAN generator set.

The purpose of this manual is to familiarize the user on how to use and work with the electrical generator, its components and maintenance.

We recommend a carefully reading this document prior to working with the equipment to ensure its correct use.

Save this manual for future reference and if the generator set is resold be sure to include the manual along with the unit.

The following is a general description of the unit and the information necessary for installation, operation and preventive maintenance.

Additionally, you should have received a specific user manual for the engine and alternator, electrical setup, a set of keys, ATS (upon order), silencer or exhaust tube and flexible tube (supplied separately for open-skid units).

Should you have any problem with the equipment provided, please contact the distributor directly.

GRUPOS ELECTRÓGENOS GESAN, S.A., in a constant effort towards product improvement, shall revise its manuals and include improvements made to the supplied units. Thus the information contained in this document is subject to change without prior notice and without obligation to update.

2.- BASIC SAFETY RULES

Safety precautions and recommendations for handling the generator set supplied by GESAN.

1) Do not allow the unit to be used by non-authorized personnel or minors not accompanied by an adult.
2) Use the necessary Individual protection equipment.
3) Ground the machine and ATS panel.
4) Make sure there is sufficient lighting on the control panel.
5) Do not install the open-skid electrical generator outdoors: risk of electrocution and non-functioning.
6) The connection should be made by a qualified electrician in accordance with current norms and regulations. An incorrectly made connection can cause electrical feedback with electrocution hazards for anyone working with the mains power supply. The mains connection should always be made using an automatic transfer switch (ATS); if none has been supplied, contact your distributor or GRUPOS ELECTRÓGENOS GESAN, S. A.
7) The supply line between the generator set and the consumers should be protected by means of a differential relay for protection against earth leakage.
8) The electrical installation between the generator unit and ATS should be protected using electromagnetic circuit breaker for protection against short circuits. The circuit breaker is supplied optionally by GRUPOS ELECTRÓGENOS GESAN, S.A.
9) Do not operate the unit with the doors open: risk of electrocution, burns or entrapment.
10) The exhaust system produces enough heat to ignite certain materials.
11) Do not inhale exhaust gases produced by the unit.
12) Do not touch the engine or the exhaust while the generator set is operating as this could produce serious burns.
13) Ensure proper ventilation in the area where the generator is installed in order to guarantee sufficient flow of cooling air.
14) Do not refuel while the engine is running or in poorly ventilated areas.
15) Know how to stop the unit in case of emergency.
16) The fuel used is flammable and volatile.
17) Do not overfill the tank and make sure it is closed properly after filling. Use extreme precaution if fuel is spilled: the vapors and the fuel itself are flammable. Clean the area completely before starting up the unit.
18) Do not smoke or bring any flames or sparks in the vicinity of the generator set: risk of explosions.
19) If you notice abnormal behavior by the generator set, stop the unit, locate, examine and resolve the potential failure of the unit prior to restarting. Contact our technical services department if needed.
20) Keep the unit at least one meter away from buildings or other units.
21) Be cautious when switching or installing batteries as they contain acids which are highly hazardous. Avoid spills and use protection to avoid contact with the skin and eyes. In case of contact, rinse thoroughly with water and contact a doctor immediately.
22) In case of ingestion of battery acid, drink large amounts of water and milk and contact a doctor immediately.
23) Use only distilled water in the battery: tap water reduces its life expectancy.
24) If a battery is filled above the maximum level, the electrolytes will spill out; if this happens, clean the area quickly to avoid corrosion of the parts it has come in contact with.
25) Frequently clean the unit to avoid obstructions or the entry of foreign elements into the unit (dust, moisture, etc.).
26) Regularly inspect the unit's electrical cables.
27) Prolonged contact with used oil can cause skin cancer. Wash your hands after working with the generator.
28) Avoid oil spills on both the inside and outside of the generator. In case of an oil spill on the inside of the unit, clean it properly as it could potentially become a flammable material.

3.- DESCRIPTION OF GENERATOR SET

General overview of the generator set and its different configurations manufactured by GRUPOS ELECTRÓGENOS GESAN, S.A.

Image 1 - GENERATOR SET WITH SOUND PROOF CANOPY

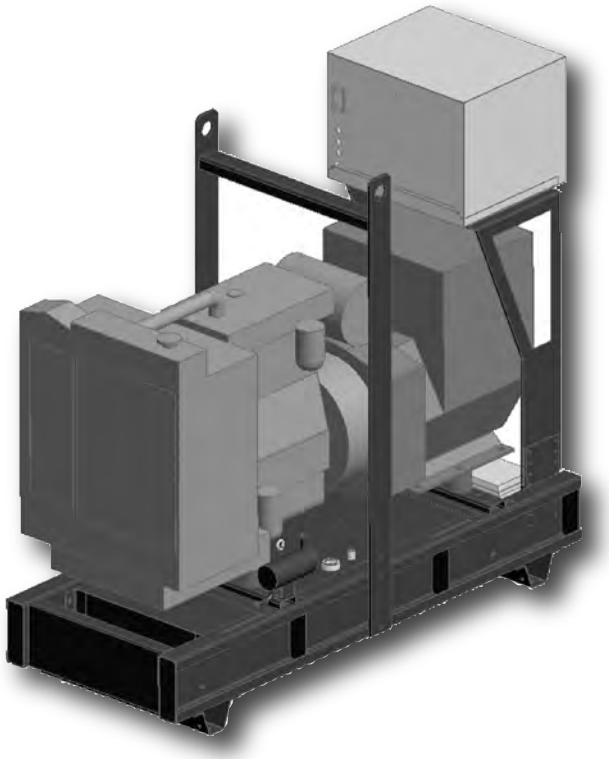


Image 2 - GENERATOR SET WITHOUT CANOPY

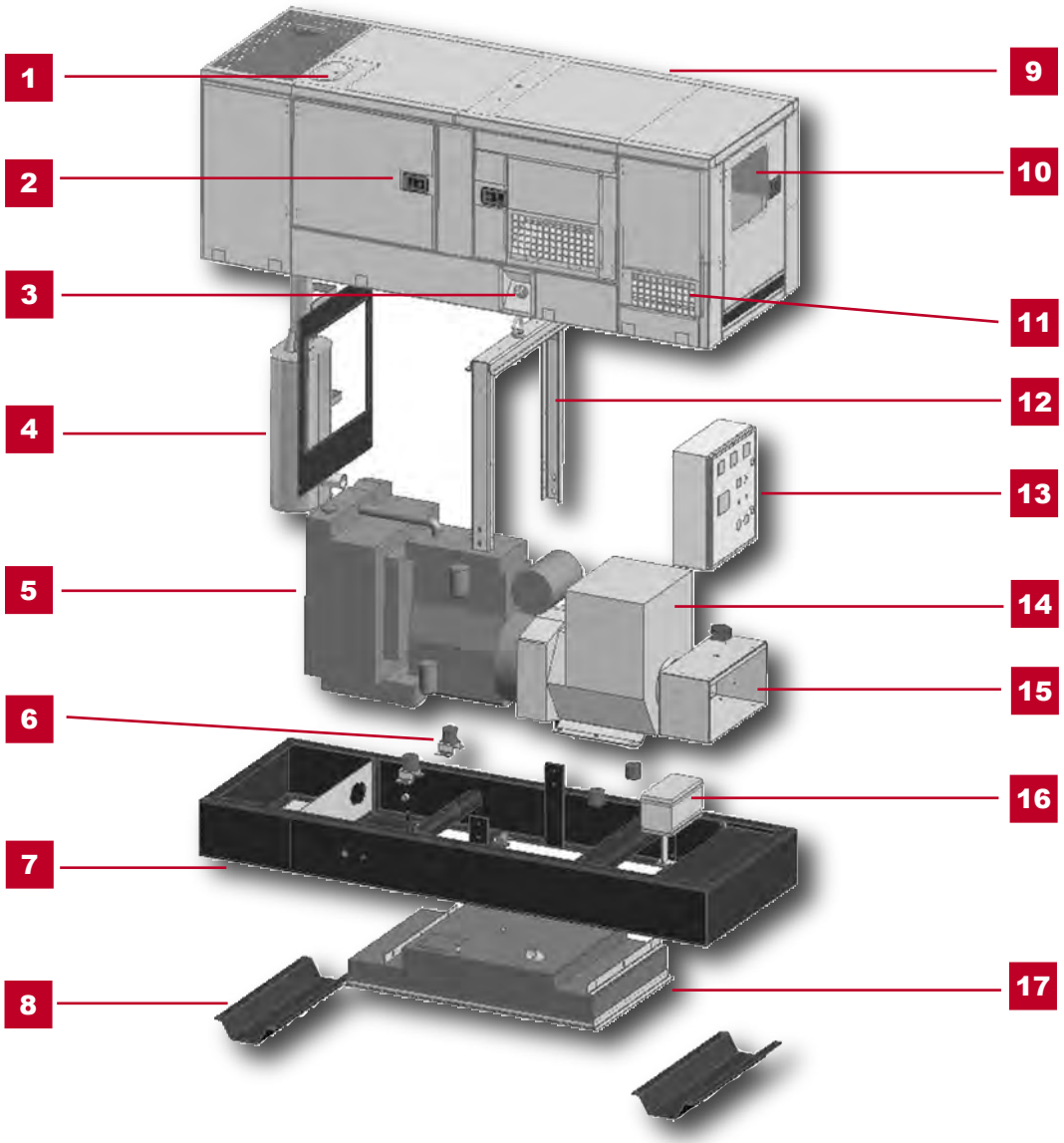


Image 3 - DETAILED VIEW OF IMAGE 1

1)	Coolant tank hatch
2)	Side access door
3)	Fuel tank cap
4)	Exhaust silencer
5)	Engine
6)	Shock absorbers
7)	Base frame
8)	Base support
9)	Canopy
10)	Electrical panel door
11)	Ventilation grill
12)	Lifting frame and eyebolt
13)	Electrical control panel
14)	Alternator
15)	Electrical power control panel
16)	Battery
17)	Fuel tank

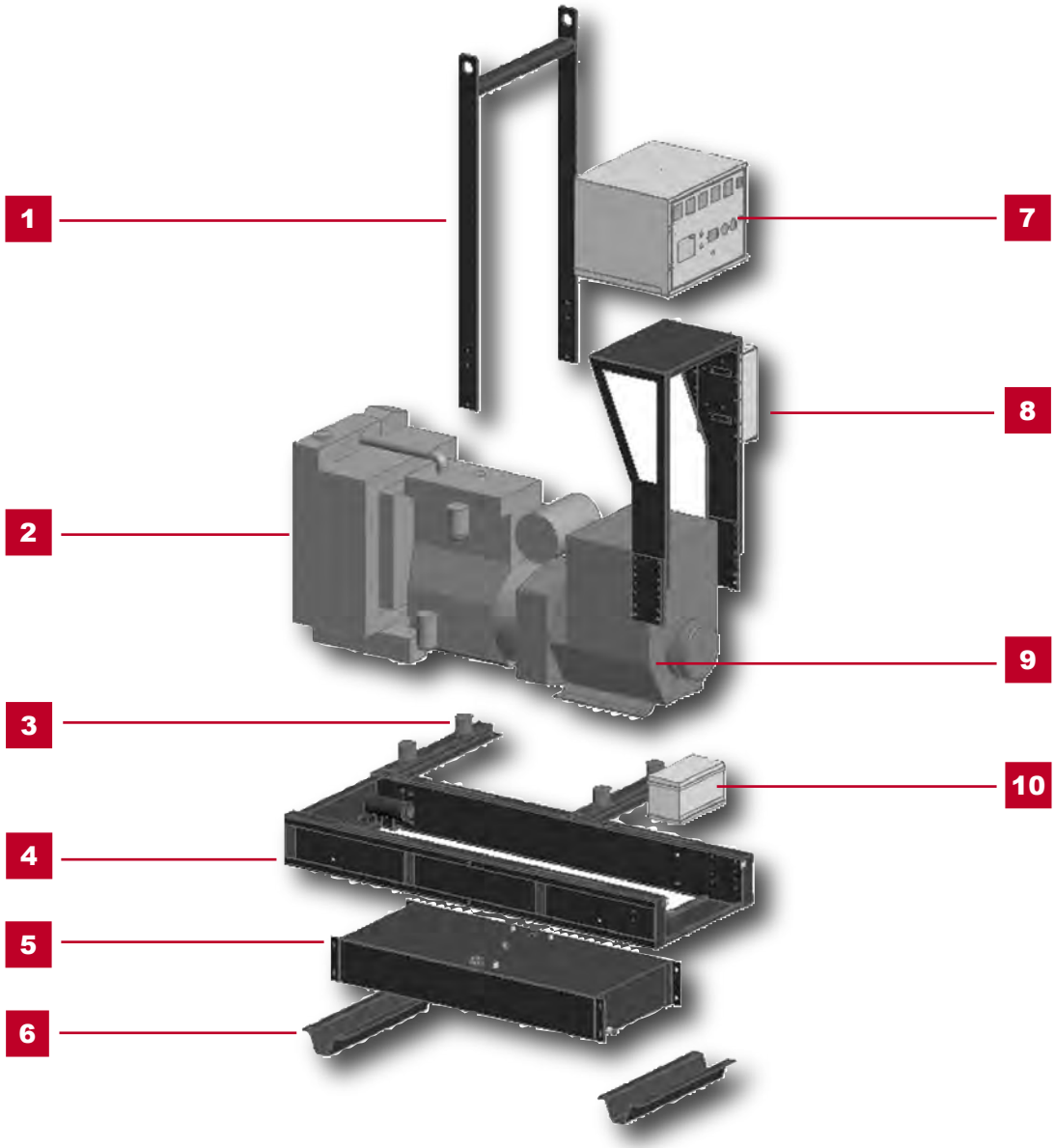


Image 4 - DETAILED VIEW OF IMAGE 2

1)	Lifting frame
2)	Engine
3)	Shock absorbers
4)	Base frame
5)	Fuel tank
6)	Base
7)	Electrical control panel
8)	Electrical power control panel (optional)
9)	Alternator
10)	Battery

3.1 .- SOUND INSULATION

The supplied unit may be:

- **Soundproofed.** Includes sound-insulating canopy.
- **Open skid.** Please keep in mind that compliance with current regulations requires that proper sound insulation be provided for this model. (See 4.2 INSTALLATION).

Each generator set is provided with a sticker indicating the level of noise output produced and the need to use hearing protection.

Noise output 90 dBA	Noise output 114 dBA	Use of hearing protection required.

The noise level has been measured according to the european directive 2000/14/EC and in compliance with the maximum levels established by directive 2005/88/EC.

Image 5 - INTERIOR OF A SOUNDPROOFED GENERATOR SET

3.2.- CONTROL UNITS

The unit provided may be controlled by different modules depending on the type of function it has been designed to perform.

The following is a generic control panel, which contains all of the electrical and mechanical options available.

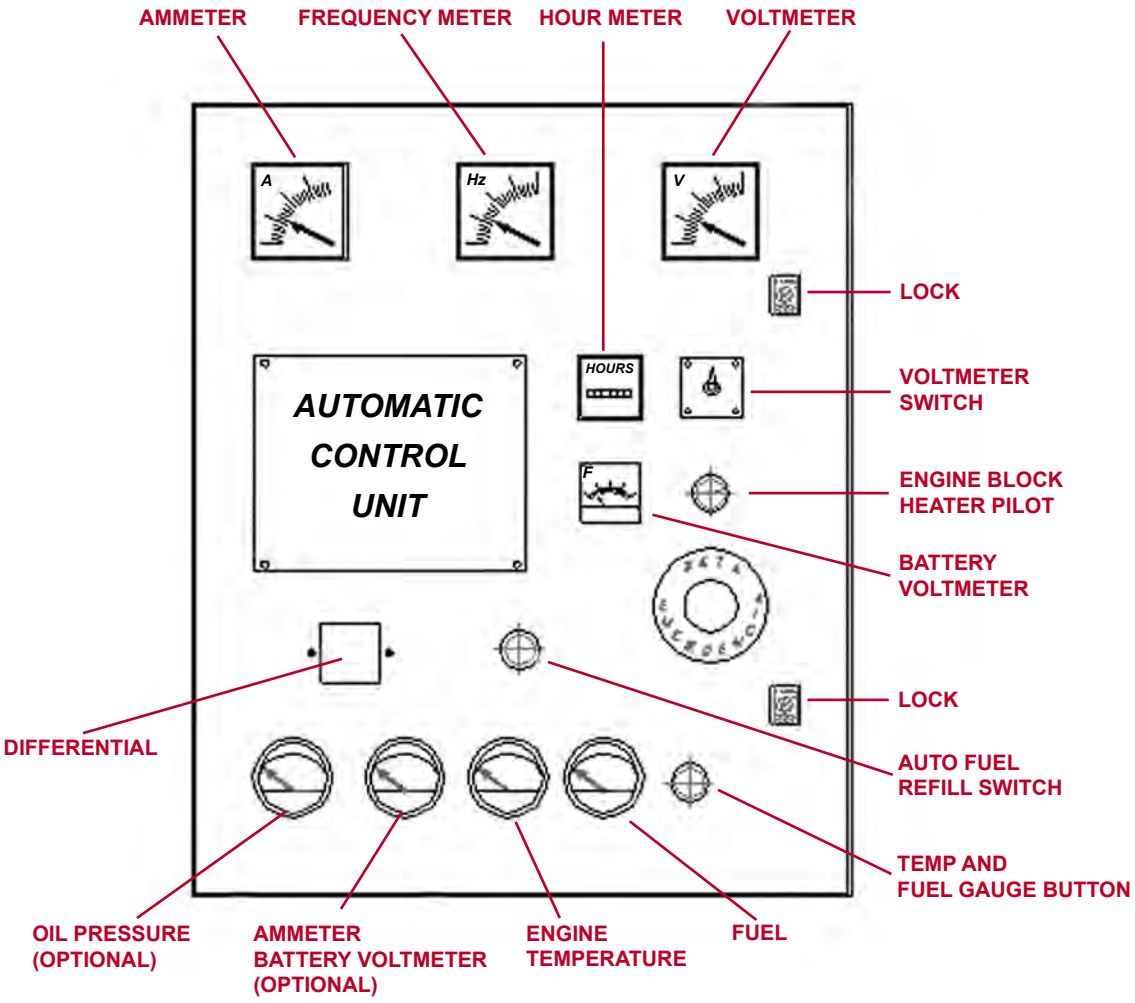


Image 6 - GENERIC CONTROL PANEL

3.2.1.- GECO / GPM-2 analog control module

If you purchased a generator unit with a GECO control module, the electrical panel will look like the following diagram:

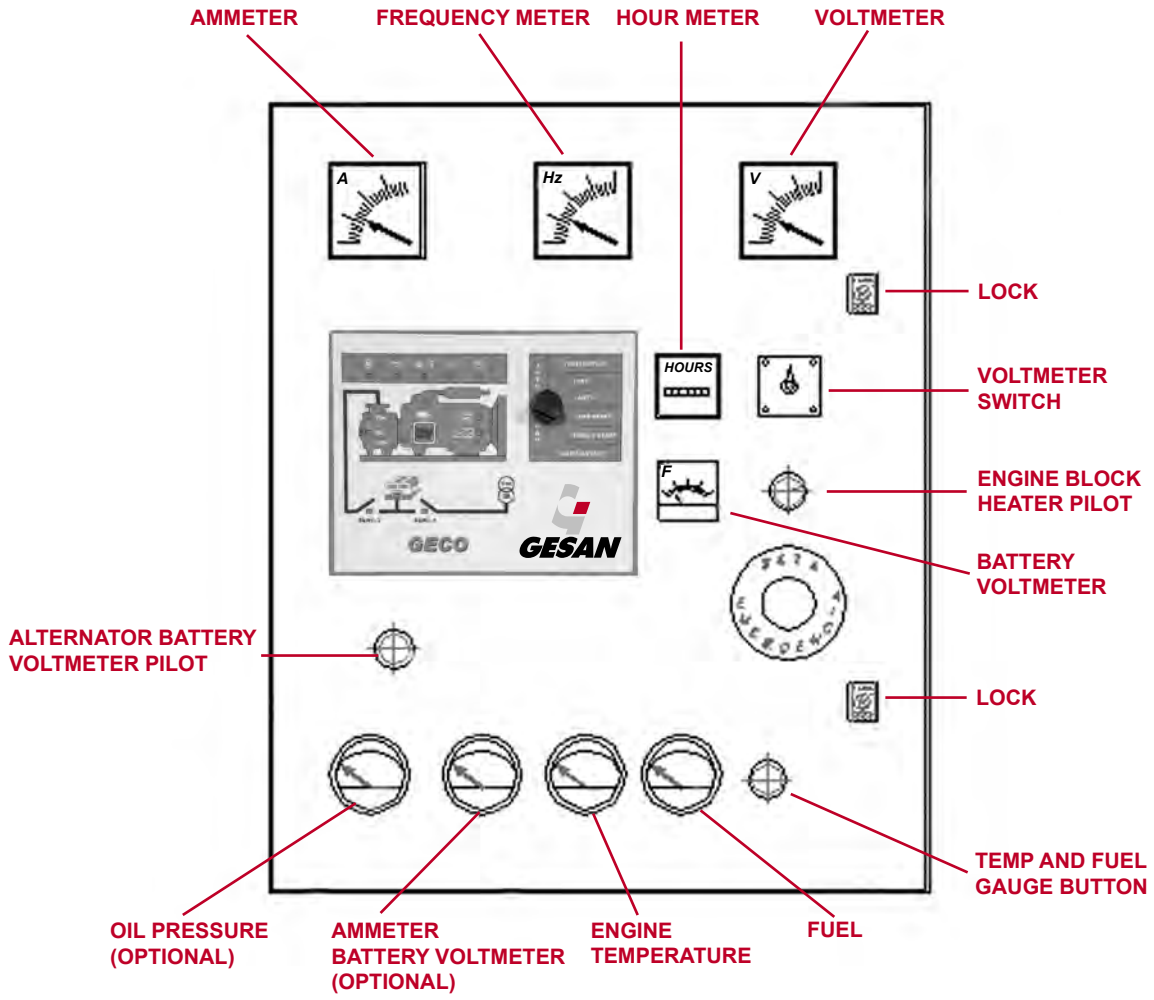


Image 7 - - ELECTRICAL PANEL OF GECO CONTROL MODULE

If you purchased a generator unit with a GPM-2 control module, the electrical panel will look like the following diagram:

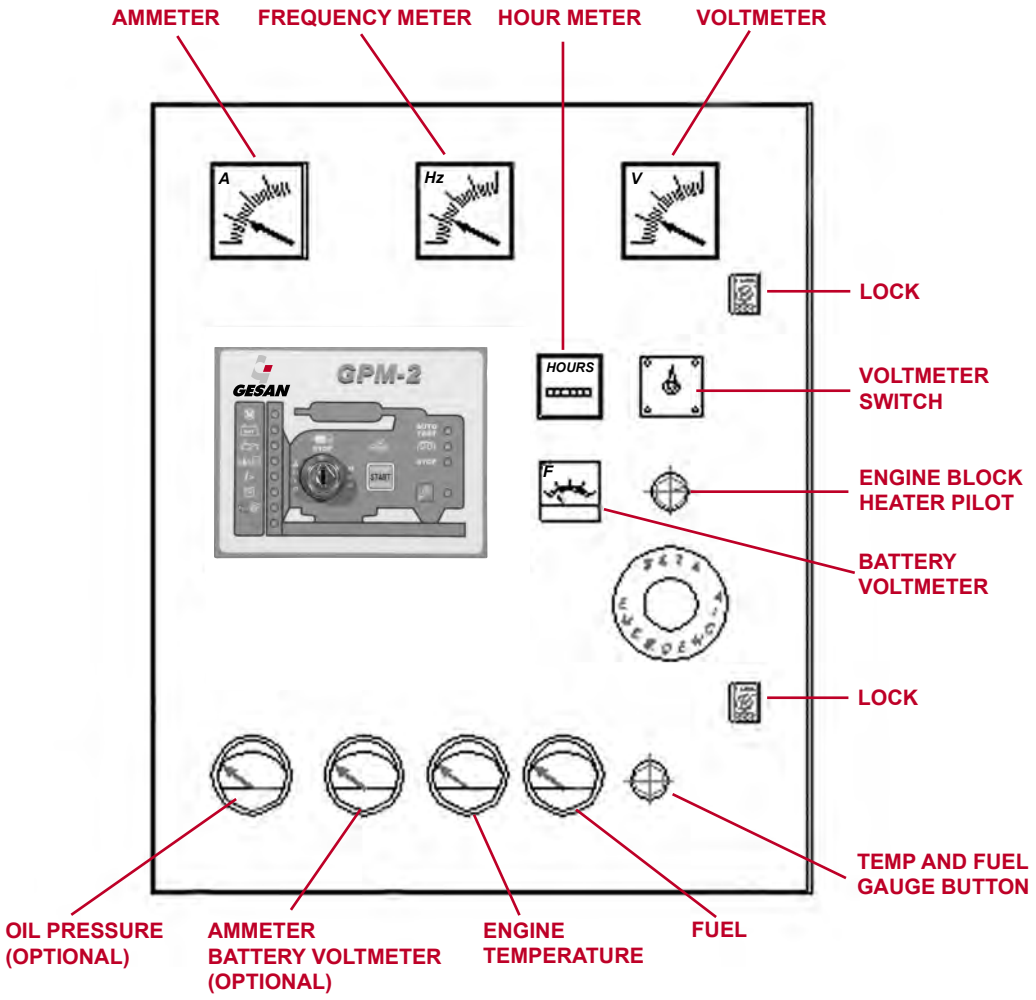


Image 8 - CONTROL PANEL OF THE GPM-2 CONTROL MODULE

3.2.2.- DEEP SEA digital control Module

If you purchased a generator unit with a DEEP SEA control module, the electrical panel will look like the following diagram:

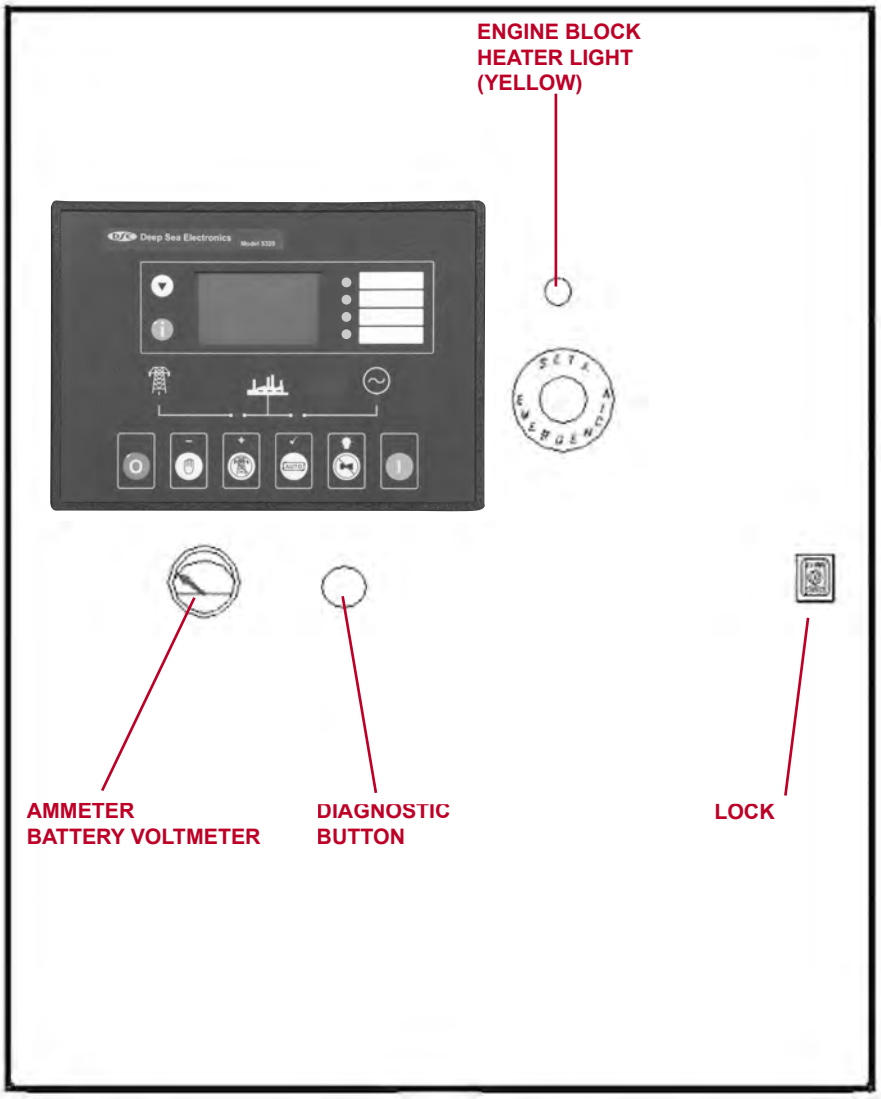


Image 9 - CONTROL PANEL OF THE DEEP SEA CONTROL MODULE

Note: The *button on the control module performs the same function as the diagnostic button (while in OFF/AUTO mode).*

3.2.3.- INTELIGEN digital control module

If you purchased a generator unit with an INTELIGEN control module, the electrical panel will look like the following diagram:

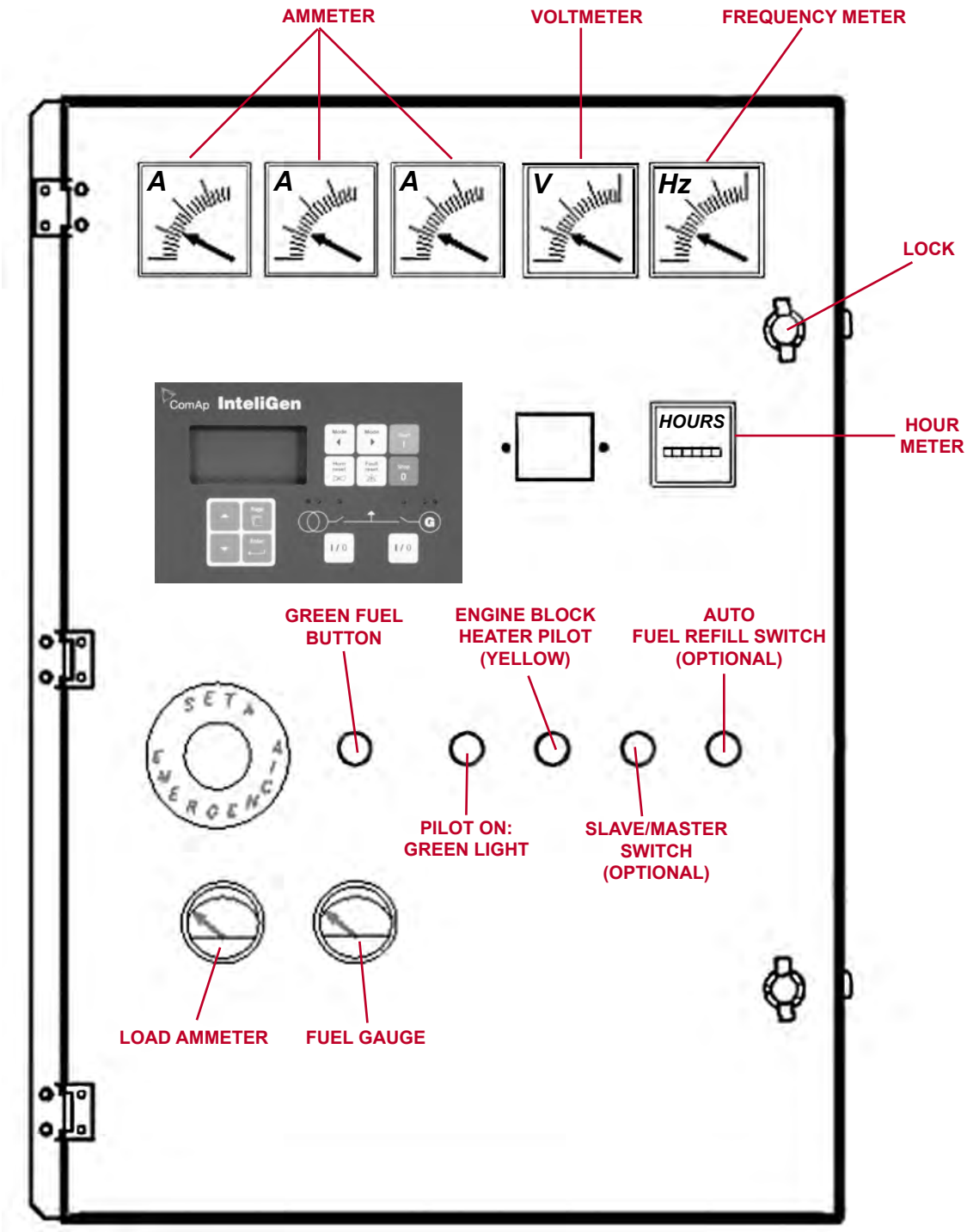


Image 10 - CONTROL PANEL OF THE INTELIGEN CONTROL MODULE

3.3.- ELECTRICAL CONFIGURATION

The supplied unit may be one of three types:

- The generator unit is supplied **with ATS**.
- The generator unit is supplied **without ATS**. Note that its installation is required.

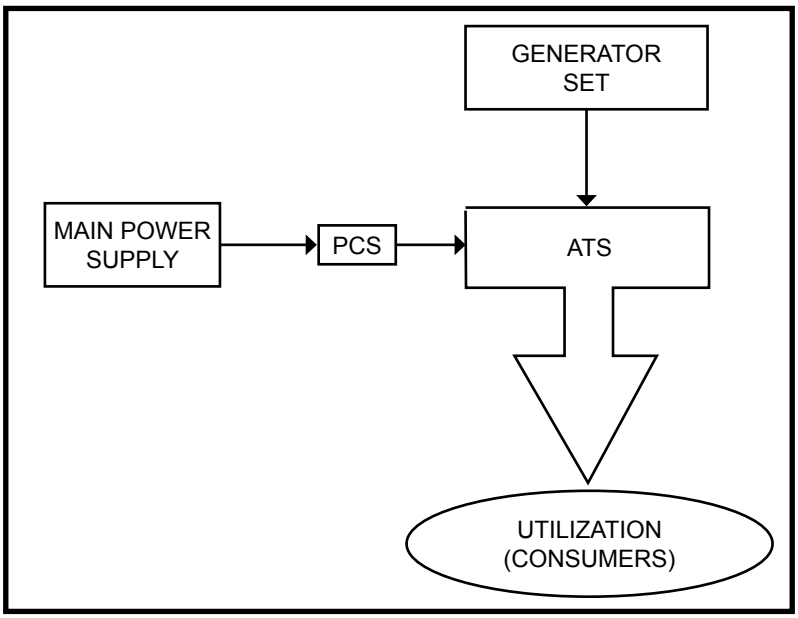


Image 11 - LOAD TRANSFER DIAGRAM

Note: PCS = Power control switch.

ATS may be with contactors or motorized transfer switch.

- **Standby by signal.** The generator set without ATS sits idle until it receives a signal from an autonomous external system which monitors the mains and controls the transfer switch for startup.

3.4.- RETENTION BATH

The generator set may include a built-in galvanized drip pan to prevent spills from the unit—such as fuel, oil or coolant—with a capacity of 110% with respect to the total volume of liquids in the generator set.

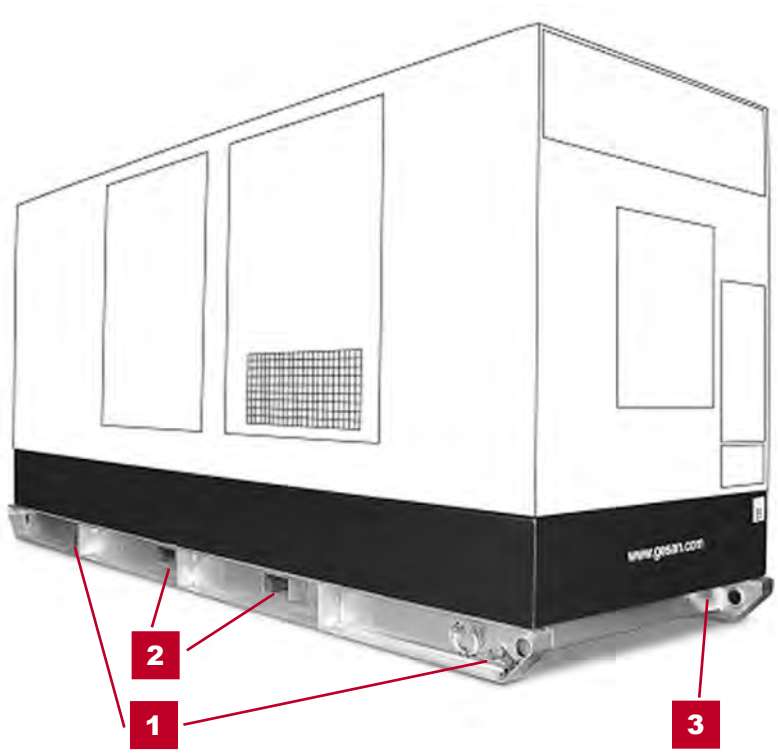


Image 12 - DRIP PAN

1) 4 drain plugs, 2 on each side of the pan
2) Slots for inserting forklift arms
3) Retention bath level senders (optional)

4.- INSTALLATION OF THE GENERATOR SET

4.1.- UNLOADING AND TRANSPORT

When unloading an generator set, certain minimum conditions should be observed in terms of safety and efficiency. The loading and transport of the unit should be done by qualified personnel.

- The ground must be capable of supporting the full weight of the generator and the forklift.
- Make sure that the battery is disconnected.
- Make sure that the fuel tank is empty..
- Place the open arms of the forklift below the chassis at an equal distance with respect to the lifting frame.
- With a hoist, raise the unit using the lifting frame eyebolt.

The image below shows a drawing of a generator unit which includes a frame with a single lifting point.

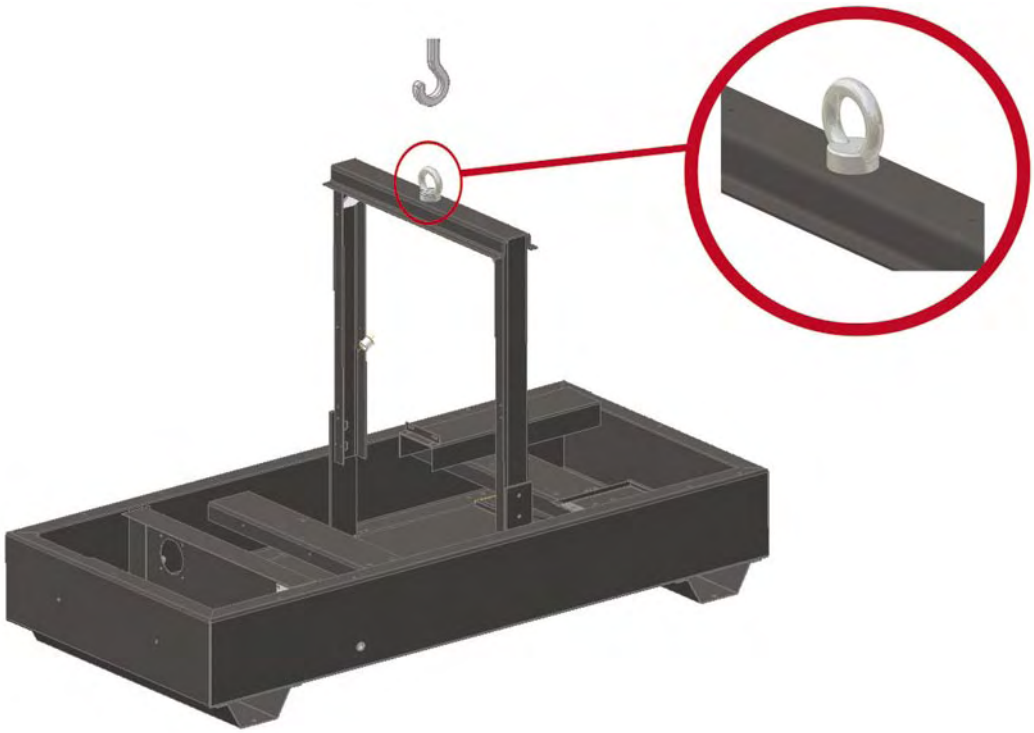


Image 13 - LIFTING FRAME

4.2.- INSTALLATION

This manual describes the installation of a “generic” generator set comprised of a diesel engine, an alternator and an electrical panel. Our technicians can advise you on each of the specific applications.

4.2.1.- Premises

The following considerations must be kept in mind: the fuel supply, ventilation of the premises, the output and direction of the exhaust gases and the noise produced.

- **Dimensions**

The dimensions should allow for the various required maintenance or disassembly operations. A minimum of one meter should be left on all sides of the generator to allow for the doors to be opened.

- **Openings**

The premises should have an entrance that is large enough for the generator to pass through and allows for ventilation (fresh-air intake, hot-air exhaust), with the appropriate surface area based on the generator’s output, the premises’ cooling system and the soundproofing system used.

4.2.2.- Start of installation

GRUPOS ELECTRÓGENOS GESAN, S.A., does not recommend installing canopied units in closed spaces.

If the unit must be installed in a enclosed space, it is recommended to use an open-skid model and soundproof the work area, in keeping with the current fire-prevention regulations.

The following image shows a typical installation of an open-skid unit in a closed space.

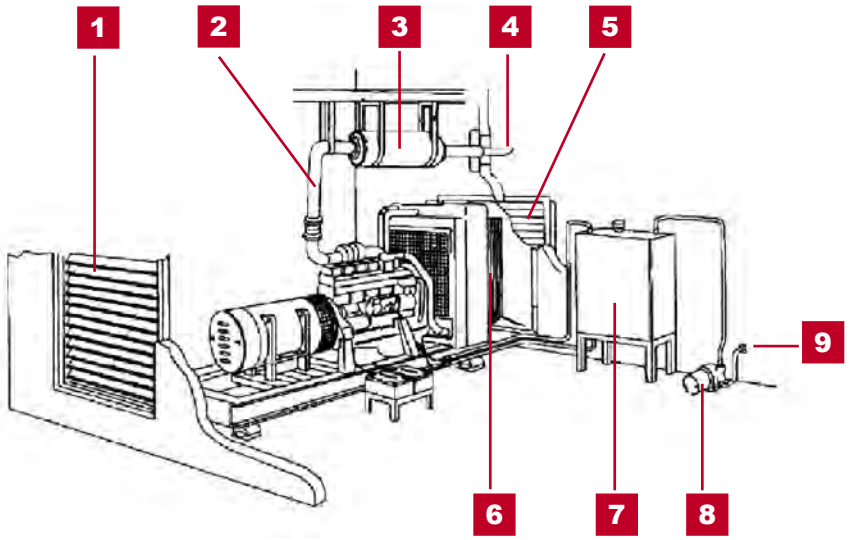


Image 14 - DETAILED VIEW OF INSTALLATION OF AN OPEN-SKID UNIT

1) Air intake grill. Will be at least 1.4 times the surface area of the engine’s radiator panel.
2) Smoke exhaust line. This will be explained in more detail later.
3) Silencer. Must be firmly installed and fastened to a stable structure.
4) Smoke exhaust outlet. Smoke must flow out through a point which impedes its reentry into the space where theworking unit is installed.
5) Radiator air outlet grill. Will be at least 1.25 times the surface area of the engine’s radiator panel.
6) Channeling duct for cooling air. Prevents re-entry of hot air into the space where the unit is installed.
7) Optional fuel tank. The tank may or may not be supplied by GRUPOS ELECTRÓGENOS GESAN, S.A.
8) Auxiliary fuel pump, SAB-BE system. Optional accessory for filling of the electrical generator’s day tank from large-capacity tank.
9) Fuel line, adequate for transporting fuel and complies with current regulations.

4.2.3.- Ventilation and cooling

The heat produced by the generator's thermal engine must be evacuated from the premises.

The heat is generated by the cooling of the cylinders, the radiation from the engine block, the exhaust passage, the cooling of the alternator and the radiator air output.

Insufficient ventilation could produce an increase in the atmospheric temperature of the premises and cause the generator to lose engine power or even shut down.

4.2.4.- Fuel

In keeping with current legislation, special attention should be paid to the storage of fuel, which is classified as a hazardous product. The installation of the generator will include a day tank and an optional fuel storage tank.

Depending on the output of the generator, the fuel tank may be external instead of being built into the base frame.

The tank should be installed within a maximum distance (see the engine manufacturer's manual). The installation will be carried out according to current legislation.

The unit may include a self-suction, eccentric fuel transfer pump (SAB-BE) with self-adjusting blades. Includes a recirculation bypass valve. The pump has an internal removable 352 micron filter, which must be used.

Image 15 - SAB-BE PUMP

PARAMETER	VALUES
OUTPUT	1/3 H.P.
ENGINE SPEED	3,000 R.P.M.
FUEL SUPPLY	230 ACV
FREQUENCY	50 Hz, SINGLE PHASE
COOLING	FAN
BYPASS PRESSURE	From 2 to 2.5 bar
LINE IN/OUT	1" diameter
PROTECTION LEVEL	IP-25
MAX AIR FLOW	50 l/min.
PUMP INTENSITY	1.5 A
ASPIRATION	2.7 meters

N□

Note: The pump will function if the generator set is running; it has an ON/OFF switch located on the door of the unit's electrical panel.

4.2.5.- Exhaust

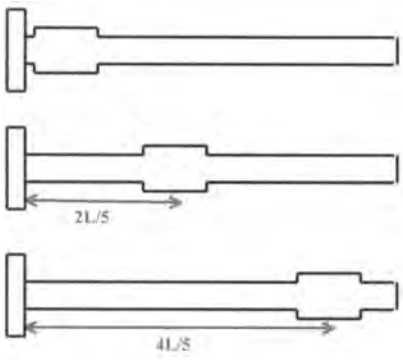
Given the importance of complying to environmental regulations, special attention must be given to gas emissions. Preventable load loss, insulation, suspension, sound levels and air contamination should all be taken into account.

The compensators and flexible tubing used in the installation will absorb the displacement of the unit (due to dilations and vibrations).

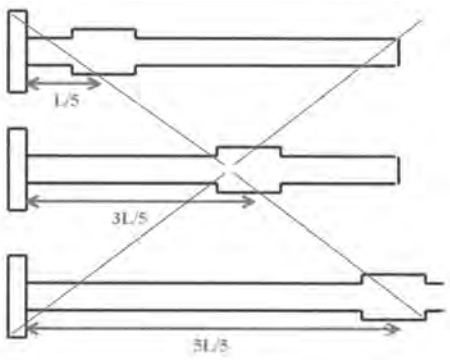
The units supplied by GRUPOS ELECTRÓGENOS GESAN, S.A., may or may not include a rain cap. The units are equipped with two holes on the underside to prevent internal water accumulation.

The potimun muffler locations are, first, directly behind the exhaust manifold, and secondly at 2/5 or 4/5 of the total exhaust system length. The reason for this are the existing standing waves, especially for long exhaust systems, when the natural tube frequency is in resonance with the fundamental engine frequency or one of its harmonics. The worst muffler locations in order of valve are 1/3, 3/5 or at the end of the system.

The best muffler locations in order of values are



The worst muffler locations in order of value are



L= total exhaust system length (elbows may be considered as straight portions).

Note: In installations where it needs long exhaust system. It will must have bigger diameter. If the installation isn´t correct.

4.2.6.- Generator startup

Startup failure entails the stopping of the motor and, as a result, of the entire generator unit. The intention is to ensure correct startup of the generator set by preheating the entire unit (heating of coolant water) by means of a boiler connected to the mains voltage. It will be correctly indicated on the panel by a lamp, which will be turned on or off automatically as needed.

Note: The generator set includes a regulated factory thermostat between 40º y 60ºC.

The startup system used by the generator set is electrical and consists of a 12 or 14 V electric engine powered by one or more batteries, usually lead.

If the unit has been shipped to somewhere outside Spain, the placement into service of the dry-charged batteries should be done by removing the vent caps, filling each cell using sulfuric acid with a density of 1.28 (or 1.23 in tropical countries). Let it sit for at least 20 minutes and check the electrolyte level (25 mm above the plates); never fill to the brim. Put the caps back on.

It is recommended that protective eyewear and gloves be worn when adding battery acid. Make sure that there is nearby access to running water in order to wash any areas that come into contact with the acid.

All operations must be performed with the utmost precaution and safety as indicated in this manual. (Be especially careful with potential short circuits that could occur when coming in contact with the unit's metallic objects).

4.2.7.- Electrical connection

These connections should be made while following a number of safety measures:

1) Use the proper individual protection equipment to ensure complete safety while performing the electrical installation.
2) Set the control module switch to the OFF position.
3) Make sure the emergency button has been pressed.
4) Verify that the battery is disconnected.
5) Swich off main power.
6) Before beginning the installation of the unit provided, make sure that it meets your particular needs for voltage and frequency.
7) Handle cables with maximum precaution as they may carry a charge.
8) The installation of the electrical generator must be performed correctly and the ATS ground connection should be identified by the following icon:

The unit manufactured by GRUPOS ELECTRÓGENOS GESAN, S.A., may or may not be supplied with ATS (depends on electrical configuration: see section 3.3); if it is not supplied, it must be added by the customer.

The ATS is comprised of contactors or a motorized switch supplier. The ATS will prevent simultaneous supply by the mains and the electrical generator.

The following diagram shows the ATS setup.

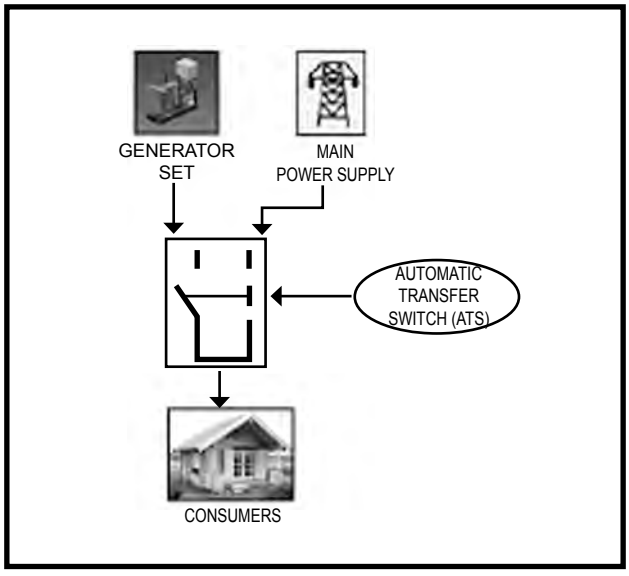


Image 16 - ATS SETUP

The electrical installation of the ATS is performed in two separate steps: first, the installation of the CONTROL section (control and management of mains and ATS) and second, the ELECTRICAL POWER section (transmission of electrical energy).

The following diagram shows the connections of a typical ATS manufactured by GRUPOS ELECTRÓGENOS GESAN, S.A.

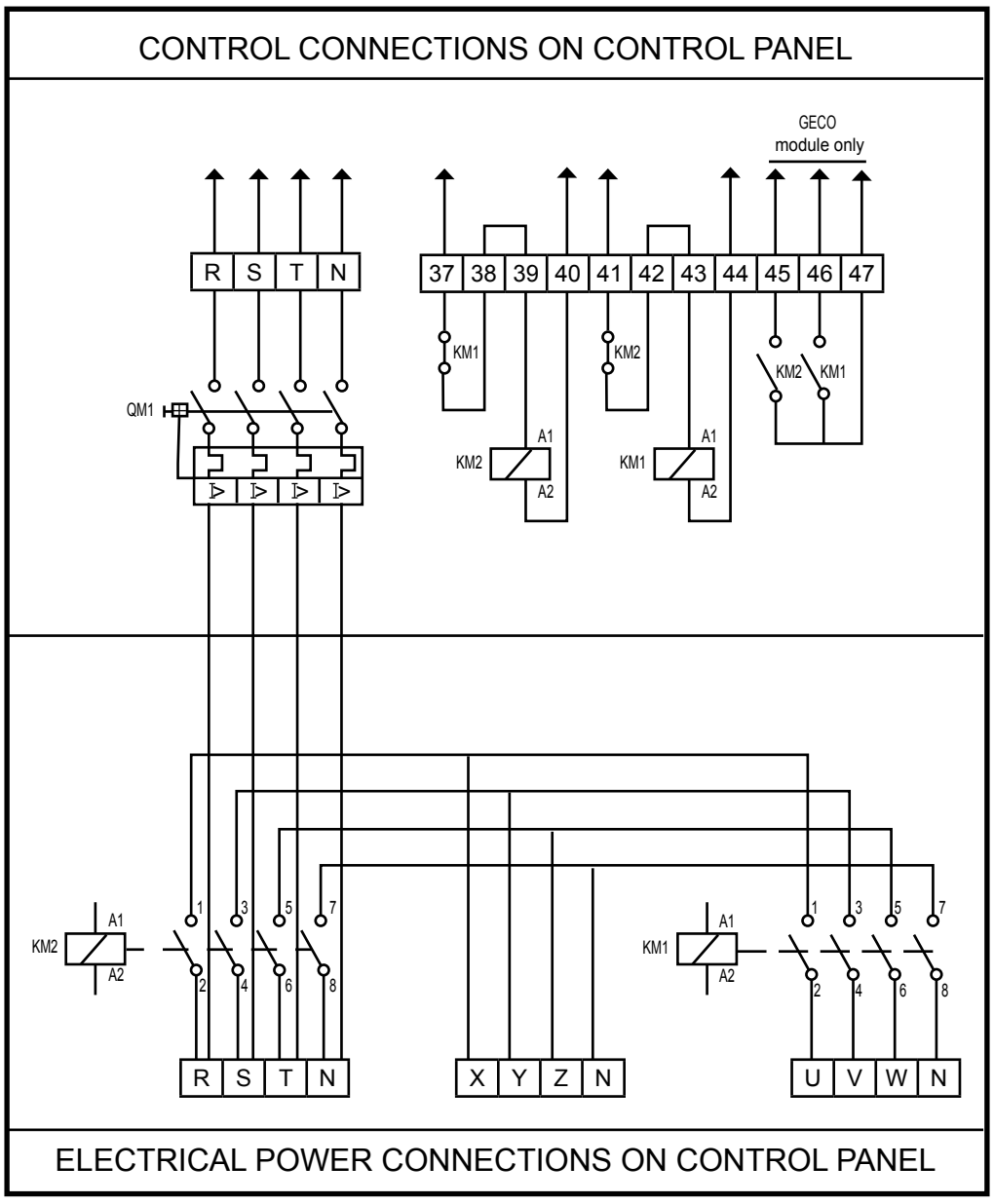


Image 17 - DIAGRAM OF CONTROL PANEL

4.2.7.1 Installation of CONTROL section:

The installation of the control section can be done in three different ways:

1) ATS supplied by GESAN
2) ATS not supplied by GESAN
3) Unit is the “Standby by signal” type

1) ATS provided by GRUPOS ELECTRÓGENOS GESAN, S.A

Connect the terminals R S T N on the control panel installed on the generator and the terminals numbered 37, 40, 41 and 44 (for the GECO module, also connect 45, 46 and 47) to the terminals on the ATS panel with the same numbering.

CAUTION: Do not mistake control terminals R S T N with the electrical power terminals R S T N (see the connections diagram preceding the installation instructions for the control and electrical power sections).

In making these connections, you must use an 8-wire conductor (or 11-wire for the GECO module) of 1.5mm², the length of which will depend on the distance separating the two panels; this cable is not provided with the generator set.

The maximum distance between the electrical panel and the and the ATS panel should be 25m for a 1.5mm² section and a voltage of 650 kVA. In case of higher voltage, use the same maximum distance and a 2.5mm² section.

2) If the ATS was not supplied by GRUPOS ELECTRÓGENOS GESAN, S.A., check the user manual of the corresponding ATS and follow these steps:

- Connect the terminals R S T N of the control panel (referential Mains Voltage) to the input of the electric company mains.
- Connect the terminals numbered 37 to 47 to the ATS control panel (check the electrical setup on the electrical generator control panel).
- Make sure that the electrical and mechanical interlocking is completed correctly. Also make sure that the ATS that you want to install is compatible with the generator unit provided. Assembly is typicall y done with contactors; for motorized switches please check with GRUPOS ELECTRÓGENOS GESAN, S.A.
- The conductor section must be adequate for installation.

3) If your generator unit is the “Standby by signal” type, it will not monitor the mains or control the ATS: these must be controlled by the user’s management system.

The terminals through which the generator set receives the startup signal are 184 and 185, which should be volt-free.

The generator set uses terminals 120 and 121 to return a volt-free signal when the voltage and frequency of the generator set are correct.

Terminals R S T N should be connected to a mains input prior to the ATS, as these terminals provide the power supply for the engine block heater and battery maintainer. The conductor section should be appropriate for your installation.

4.2.7.2 4.2.7.2 Installation of ELECTRICAL POWER section:

A diagram of a connection can be seen in image 15.

The ELECTRICAL POWER installation may be done in two ways:

1) **ATS supplied by GESAN**

- Connect the generator's current output terminals U V W N to the ATS terminals U V W N.

- Connect the electric company's power control switch (PCS) to terminals R S T N.

- Then connect terminals X Y Z N to the installation for which you want to guarantee electrical power.

2) **ATS not supplied by GESAN or the generator set is the "Standby via signal" type.**

- Connect the generator's current output terminals U V W N to the input of the ATS on the generator set. Checkthe manual of your ATS.

This installation should be performed by qualified personnel, who should determine the conductor section to be used.

Remember that you must ground the unit according to the current regulations in effect where the installation is performed.

4.3.- STORAGE

If you think your generator will be inactive for a long period of time, follow these instructions:

1) Switch the control module to the OFF position.
2) Press the emergency stop button to avoid future involuntary startups when connecting.
3) Empty the fuel tank.
4) Leave the battery disconnected.
5) Avoid storing the unit in spaces with high dust accumulation or excessive humidity.
6) Do not use pressurized water when cleaning the unit.
7) Check your engine manual for care instructions; the manual has been provided together with this document.
8) Check your alternator manual for care instructions; the manual has been provided together with this document.

5.- STARTUP

To start up the generator set, follow these steps listed below:

1) Check levels: oil, coolant and fuel.
2) Turn the battery shutoff switch to the ON position.
3) Release the emergency shutoff switch if it has been pressed.
4) Connect to the mains power and verify that the voltage indicator is giving an adequate reading.
5) Check the automatic switch or motor guard (levers should be raised).
6) After completing the pre-startup tasks, make sure that the generator's control module switch is in the desi red position. For this reason, the user should carefully read about the operation of the control module in section 6 ofthe OPERATION MANUAL.
7) It is recommendable to run a simulation of mains failure to verify that the unit is functioning properly.

Note: It is not advisable to operate the generator set at low load for extended periods of time. The generator is considered to be running at low load when it is below 30% of the unit's nominal power.

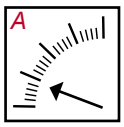
6.- OPERATION MANUAL

The generator set you purchased was designed for standby use, which means that it will mainly be operational when the mains voltage is inadequate.

Therefore it is necessary to connect the outside mains to the unit's ATS as well as to the generator set (see section 4 – Installation).

The following is a description of the different variable elements, according to the generator set chosen.

6.1.- ELECTRICAL PANEL COMPONENTS



AMMETER:

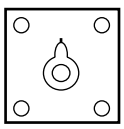
Measures the Intensity (A), by means of a switch, of the different phases of the generator set.

FREQUENCY METER:

Indicates the frequency of the generator set (Hz).

VOLTMETER:

Indicates the voltage (V) of the main power supply or generator set, depending on the position of the voltmeter switch.



VOLTMETER SWITCH:

This switch allows for voltage measurement by phase of the main power supply or the generator set.

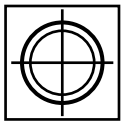
HOUR METER:

Indicates number of hours worked by the generator set.

The two digits in red on the right indicate hundredths of hours. Hours are indicated in white from the third digit on.

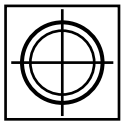
BATTERY VOLTMETER:

Indicates current voltage of battery.



ENGINE BLOCK PILOT LIGHT (WARMING UP):

Amber pilot light. Indicates engine block heating system is turned on. Turns on and off automatically according to the needs of the thermostat.

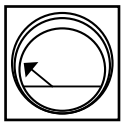


BATTERY VOLTAGE FAILURE PILOT LIGHT (GECO MODULE ONLY).

Red pilot light. Indicates alternator battery charge failure.

EMERGENCY STOP BUTTON:

Pressing this button brings the generator set to an immediate stop. To cancel, turn to the left, when the end of the emergency situation has been confirmed.



GAUGES INDICATING ENGINE PARAMETERS:

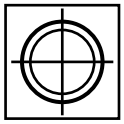
Oil pressure

Intensity of battery voltage

Engine temperature

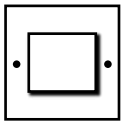
Fuel level

Activated by temperature and fuel button when generator set is stopped. When the generator is operating, the gauges show the corresponding levels.



DIAGNOSTIC BUTTON:

Allows engine parameters to be checked when generator set is stopped (electronically controlled engines). Also gives a readout of the generator's different alarms.



DIFFERENTIAL:

Protection against earth leakage of one phase, setting off the generator's set primary protection switch.

6.2.- GECO ANALOG CONTROL MODULE

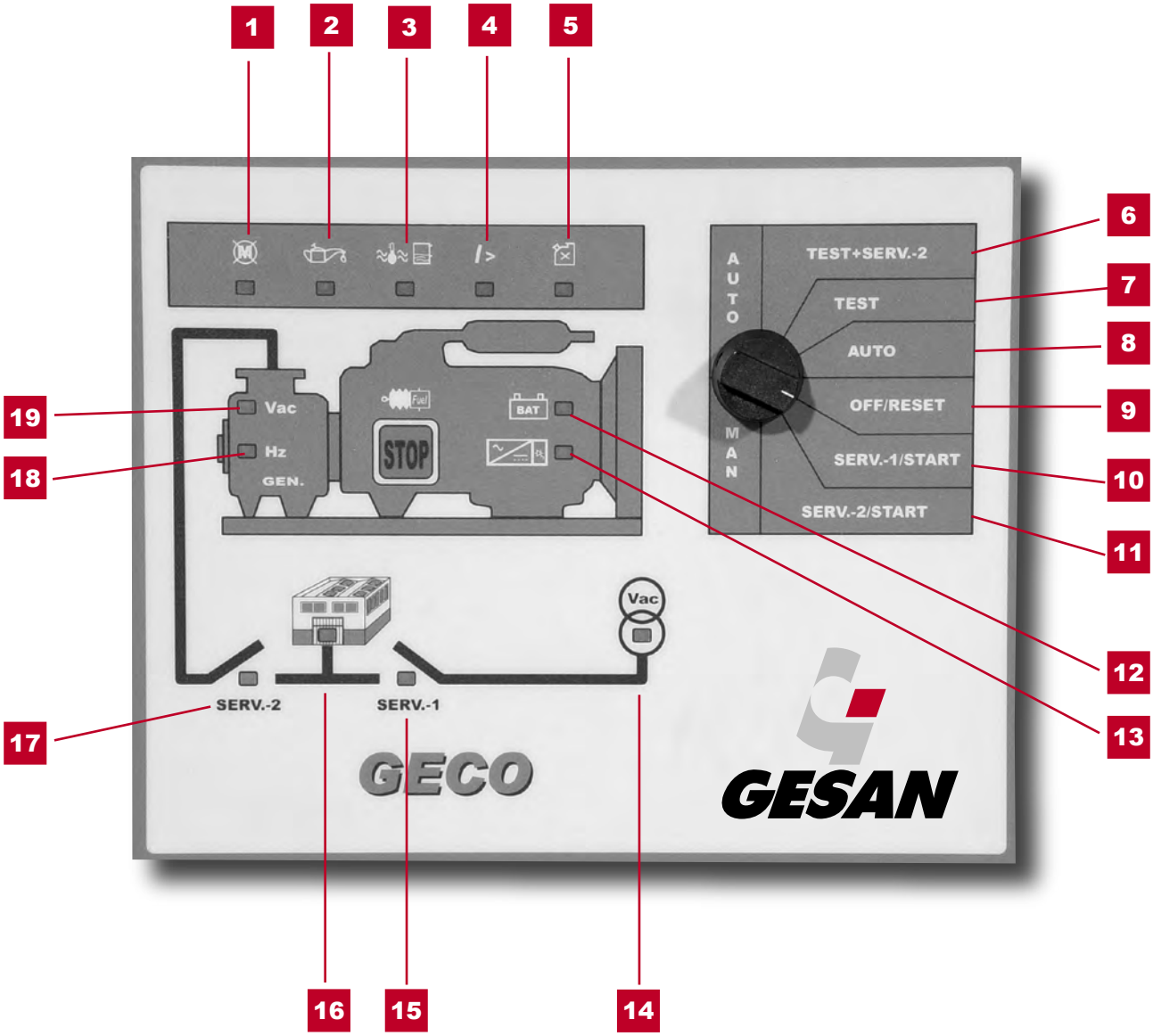
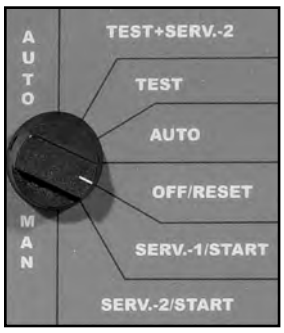
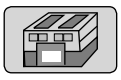
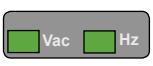


Image 18 - GECO DIGITAL CONTROL MODULE

The following is an explanation of each of the items shown on the GECO control module; this module is for generator units with/without ATS:

NUMBER	SYMBOL	DESCRIPTION	IDENTIFICATION
1		Startup failure/No voltage or frequency detected/ Emergency button pushed	Red LED
2		Low oil pressure	Red LED
3		High temperature/ Low coolant level	Red LED
4		Overload	Red LED
5		Low fuel level	Red LED
6		Load test mode	Different module operational modes
7		Test mode	
8		Automatic mode	
9		OFF/RESET mode	
10		SERV-1/START mode	
11		SERV-2/START mode	
12		Battery voltage OK	Green LED
13		Battery charging	Constant red: batteries charging/ Flashing red light: batteries fully charged.
14		Mains correct	Green LED
15		Mains contactor	Yellow LED on indicates contactor closed
16		Consumer power supply	Yellow LED on indicates consumers supplied
17		Generator contactor	Yellow LED on indicates contactor closed
18-19		Generator voltage and frequency correct	Green LED indicates correct voltage and frequency

The GECO module has six operating modes, differentiated in automatic mode (AUTO) and manual mode (MAN), which can be configured using the module switch (numbers 6-11 on the control module's descriptive panel).

- **AUTOMATIC mode (8), (normal operating mode):**

When mains failure occurs, the GECO module registers this by turning off LED indicators (14) and (13), at which point the mains contactor closes, LED (15) turns off and the command is sent to turn on the unit. There will be a maximum of three startup attempts lasting 20 seconds each, with a 10 second pause between each.

Once the unit has started up, if the generator set voltage is correct LED indicators (19) and (18) will be turned on, at which point the generator's set contactor closes and LED indicators (17) and (16) will be turned on, and the customer's installation receives a power supply until the mains power returns.

If all three startup attempts have been unsuccessful, LED indicator (1) will be lit and an acoustic signal will be given, lasting 120 seconds

Upon return of the mains power, LED indicator (14) on the control module will be lit and the unit's shutdown sequence begins, which lasts approximately 60 seconds (in order to check the stability of the mains power) following the return of the mains power, the generator's set contactor will be disconnected, which in turn shuts off LED indicators (17) and (16), followed by the closing of the mains power contactor and the illuminating of LED indicators (17) and (16).

From this moment, the unit will continue operating for 120 seconds at no load before stopping completely to cool the engine

If the mains power falters during the shutdown sequence, the operating cycle will be repeated, thus guaranteeing adequate electrical supply..

On this control module in automatic mode, two additional selections can be made (in addition to the automatic option, seen previously):

- Load **TEST MODE** (6): with the switch turned to this position, a simulation is made of mains failure and the load is transferred to the generator set. If the switch is turned to another option while correct power and intensity levels exist, the loads will be transferred to the mains power.
- No-load **TEST MODE** (7): this option simulates a mains failure: no loads are transferred to the generator set. If a mains failure occurs during this operation, the loads will be transferred to the generator unit. This mode will terminate if another option is selected.

Note: For terminating test modes, it is recommendable to turn the switch to OFF/RESET and then turn the switch to the AUTO position.

- **MANUAL mode (3 different modes)**

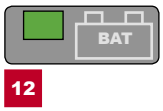
- **OFF/RESET** mode performs two functions, the first of which is to stop the unit whether it is in manual mode (MAN) or automatic mode (AUTO); the second function is to cancel the active alarms, allowing for a new startup of the generator set.
- **SERV-1/START** mode (10): when turning the switch to this option, the unit startup is ordered (manual operation of the generator unit); if it is operating in this mode and a mains failure occurs, the generator set will not supply energy to the consumers.
- **SERV-2/START** mode (11): when turning the switch to this option, the unit startup is ordered (manual operation of the generator unit) and LED (17) is lit. If the generator stops in this mode, the loads would not be transferred to the mains power. The alarms are automatically set.

If a TEST has been run, whether in automatic mode (AUTO) or in manual mode (MAN), to stop the generator set turn the control module switch to the OFF mode (9); once the engine is stopped the switch can be set to a new operating mode.

Finally, if the red STOP button is pressed, an emergency stop will take place. If the switch is turned to a position other than OFF, LED indicators (15) and (1) will light up and an acoustic signal will be activated.

Note: If the emergency stop button is pushed while the generator unit is stopped (in the OFF position of the control module), the GECO control module will not give any indication of this, however the unit will not start up.

INDICATOR LIGHTS:



12

This control module includes a 2 ampere battery charger; receives power supply from external transformer connected to the mains power. LED will turn on when battery voltage is correct.

13

LED is lit while batteries are charging. Lit only when connection with the mains power exists. LED illuminated intermittently when battery voltage is correct.

ALARMS:

The various alarms of the GECO module are LED indicators 1 through 5. There are two alarm types, one which issues the stop command and one which does not; if it is the first of these, move the switch to the OFF position (9) and fix whatever caused the alarm and select the desired option.

1

Indicates startup failure. Either voltage or frequency is not detected or the emergency stop button has been pressed; in both cases the LED indicator (1) will turn on and the control module will issue a stop command to the generator unit. To stop the alarm, turn the control module switch to the OFF/RESET position (9).

2

Indicates low oil pressure. LED indicator (2) will turn on and the control module will issue a stop command to the generator unit. To stop the alarm, turn the control module switch to the OFF/RESET position (9).

3

Indicates high engine coolant temperature or low coolant level. LED indicator (3) will turn on and the control module will issue a stop command to the generator unit. To stop the alarm, turn the control module switch to the OFF/RESET position (9).

4

Indicates overload of the generator unit. LED indicator (4) will light up and the control module will issue a stop command to the generator unit.

To stop the alarm, turn the control module switch to the OFF/RESET position (9).

Open the electrical panel door *and check the status of the motor guard. Check the reason for the overload and reset. Close the electrical panel door.*

Put the module in AUTO mode.

5

Indicates low fuel level; LED indicator (5) will be lit. System warning; must respond accordingly.

6.3.- GPM-2 ANALOG CONTROL MODULE

This module is for “Standby by signal” type generators.

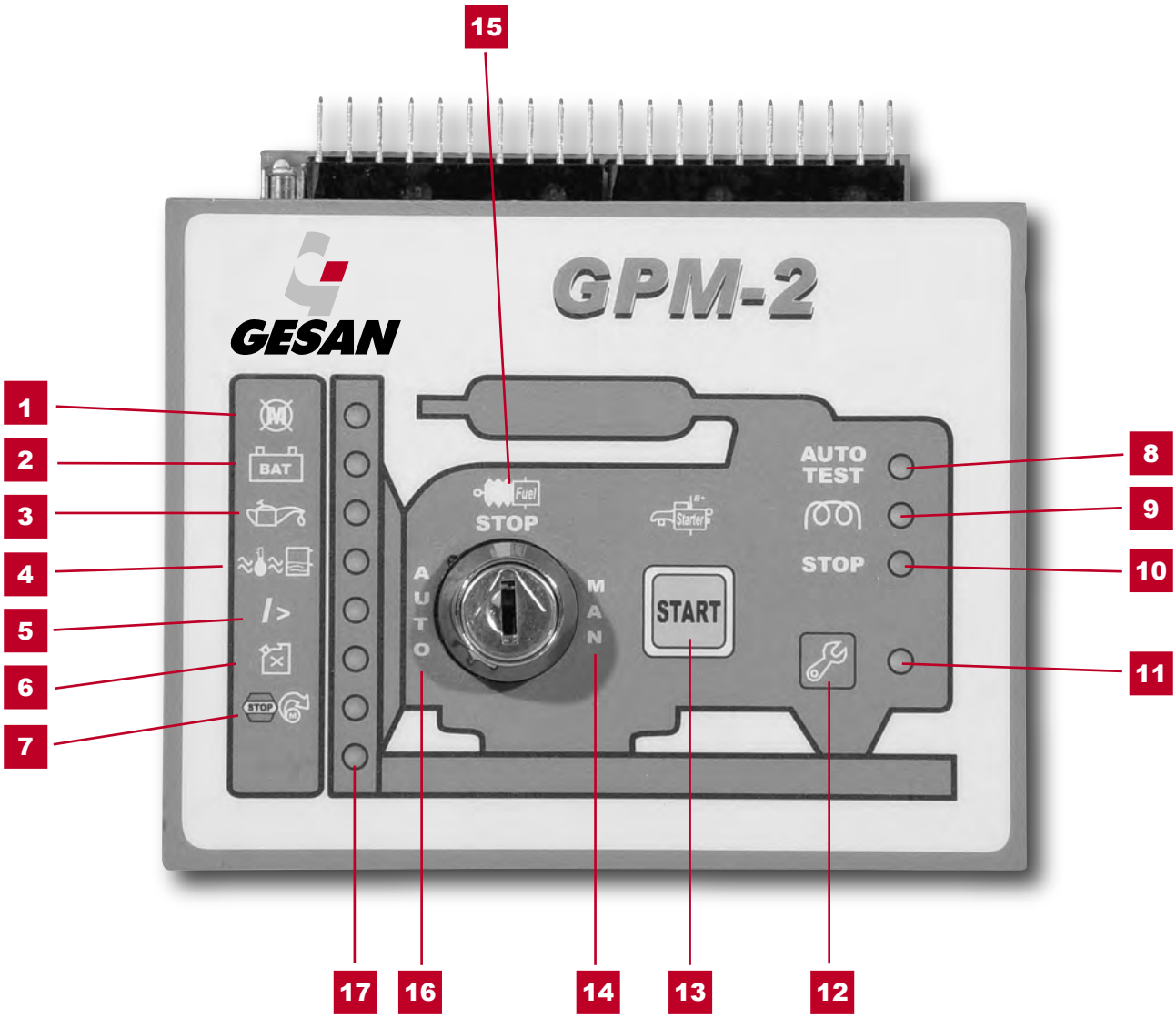
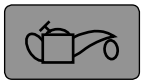
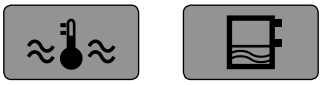
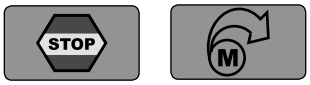
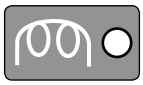
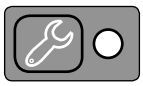


Image 19 - PLACA DE CONTROL GPM-2

NUMBER	SYMBOL	DESCRIPTION	IDENTIFICATION
1		Unit startup failure / Alternator failure	Flashing red light; three startup failures. Continuous red light; voltage failure or low frequency.
2		Battery charge failure	Flashing red light; charge failed. Continuous red light; unit stopped.
3		Low oil level	Flashing red light; low oil level. Continuous red light; unit stopped.
4		Low level / High coolant Temperature	Flashing red light; High Temperature. Continuous red light; low level.
5		Overload	Flashing red light; unit overload.
6		Low fuel level	Flashing red light; low fuel level.
7		Emergency stop / Overspeed	Flashing red light; emergency stop. Flashing red light; overspeed.
8		Remote startup mode	Green LED
9		Unit warming up	Yellow LED
10		Stop signal	Flashing red light; cool-down period. Continuous red light; stop command issued.
11		Maintenance signal	Flashing blue light; maintenance required
12		Maintenance reset button / Contact block button	Button
13		Unit startup button	Button
14		Manual mode	MAN
15		Key position for stopping unit	STOP
16		Automatic mode	AUTO
17		Programmable alarm	Flashing or continuous red light; user-defined.

The GPM-2 control module has three positions: STOP, automatic (AUTO) and manual (MAN). Key selectable (numbers 14 through 16 of the descriptive chart on the control module).

- **AUTOMATIC mode (AUTO):**

When key is turned to the automatic mode position, unit will sit idle until receiving an external startup command. If mains failure occurs, the external mains monitoring system will issue a signal to the electrical generator, which will begin to operate, supplying the necessary electricity.

At the moment in which the external startup signal is received, while the key is in the AUTO position, the LED indicator for low oil level will light up, as well as the alternator battery voltage indicator

and AUTO TEST LED

(numbers 3, 2 and 8 of the descriptive panel on the control module, respectively).

There will be a maximum of three startup attempts lasting 10 seconds each, with a 10 second pause between each.

After three unsuccessful startup attempts, LED indicator (1) will turn on.

If the unit was operating in automatic mode and the mains failure is resolved, once the external signal disappears 60 seconds will pass in order for the engine to be cooled; during these 60 seconds the LED indicator

(10) will flash and later it will be continuously displayed and the engine will stop, with the LED indicator light remaining for 20 seconds.

If the mains power falters during the shutdown sequence, the operating cycle will be repeated, thus guaranteeing adequate electrical supply.

- **No-load test mode (Manual):**

When key is turned to the manual mode position, LED indicators for low oil level (3) and alternator battery charge indicator

(2) will be turned on. To start up the unit, press the START button

(13). If the key selection has been made on the generator unit and this button is not pushed in 20 seconds, the control module will shut off the system; the startup signal will be cut off when LED indicators for low oil level (3) and alternator battery charge

(2) turn on; the startup signal will also be cut off when the frequency exceeds 20 Hz.

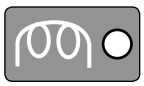
- **Load test mode (Manual):**

Must be done using the external ATS controller with the control module in automatic mode.

INDICATOR LIGHTS:

8

Indicates remote startup; continuous green light turns on when unit is operating remotely.

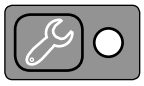


9

Indicates unit is warming up; continuous yellow light turns on when unit is being heated.

10

Indicates stop signal.
Flashing: Indicates engine cooling period.
Continuous: The control module issues a stop command to the engine; stays lit for 20 seconds following the complete stopping of the engine.



11

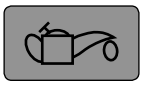
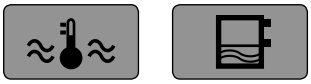
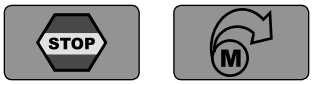
Indicates maintenance; flashing light; the first time the light turns on after 50 operating hours and afterwards every 150 hours.
To reset the maintenance hour meter, the generator set must be running; turn the key to the STOP position while pressing down the button (12) until the control module becomes completely deactivated.

12

Contact button.
If service is needed, engine contact must be maintained. With the key turned to the STOP position, press button (12) and without releasing it turn the key to the MAN position.

ALARMS:

The following is a chart describing the possible alarms of the GPM-2 module:

NUMBER	SYMBOL	DESCRIPTION	IDENTIFICATION
1		Unit startup failure / Alternator failure	If the light is flashing, generator is shut down. If light is continuous, indicates low frequency. If it runs below nominal frequency for more than 30 seconds, unit is shut down.
2		Alternator battery charge failure	If light is continuous and the engine is stopped, indicates CONTACT. If light is flashing, indicates failure and the control module issues unit stop command.
3		Low oil pressure	If light is continuous and the engine is stopped, indicates CONTACT. If light is flashing, indicates failure and the control module issues unit stop command.
4		Low level / High coolant temperaturee	If light is continuous, indicates low Coolant level and module issues unit stop command. If light is flashing, indicates high coolant temperature and the control module issues unit stop command.
5		Overload	Light will flash and indicate that the protection switch is open; module issues stop unit command.
6		Low fuel level	If light is flashing, indicated WARNING. If light is continuous, module issues unit stop command.
7		Emergency stop / Overspeed	If light is continuous, module issues unit stop command, indicating an emergency stop (emergency button activated). If the light is flashing, module issues unit stop command, indicating engine High speed.
17		Programmable alarm	If the light is continuous, indicates WARNING. If light is flashing, module issues unit stop command.

Note: If at any point 3 or more LED indicators turn on, it could indicate low battery level.

6.4.- DEEP SEA 5210/5220 DIGITAL CONTROL MODULE

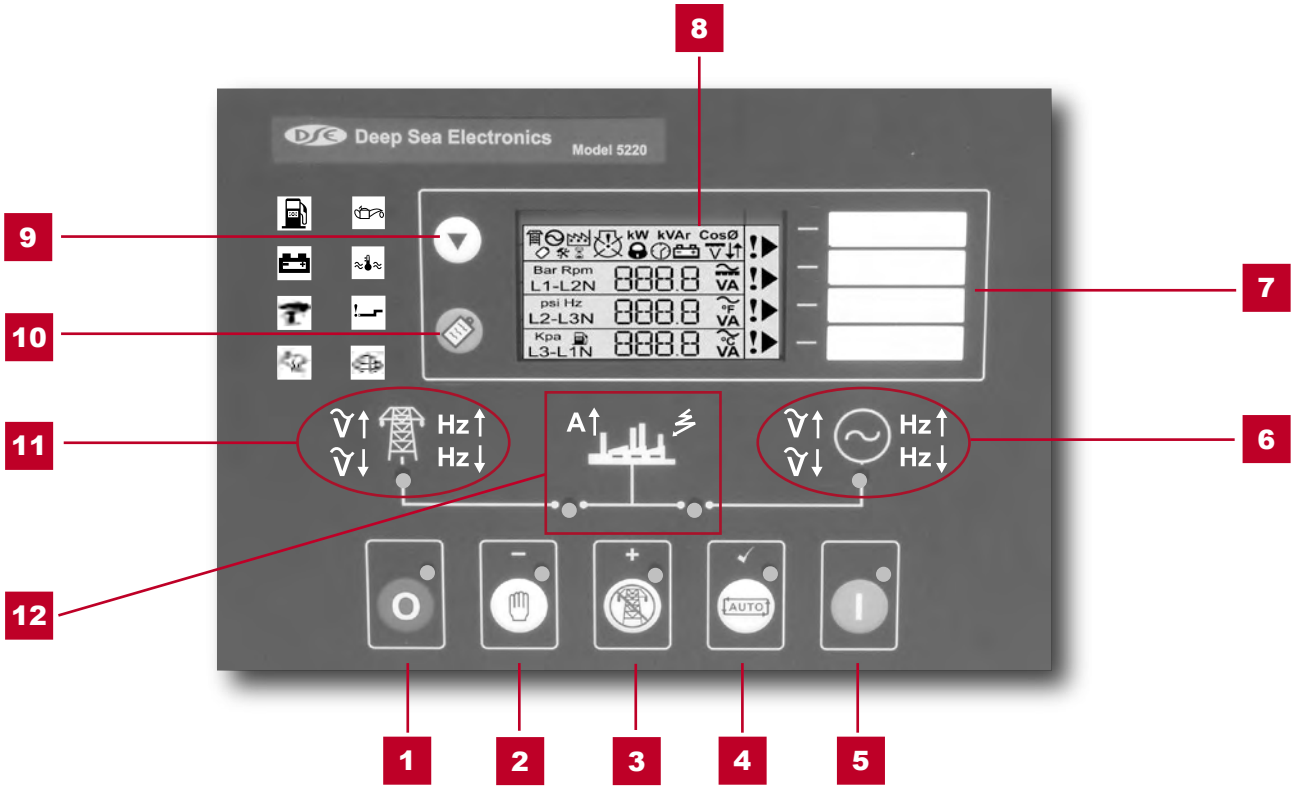


Image 20 - DEEP SEA 5220 CONTROL MODULE

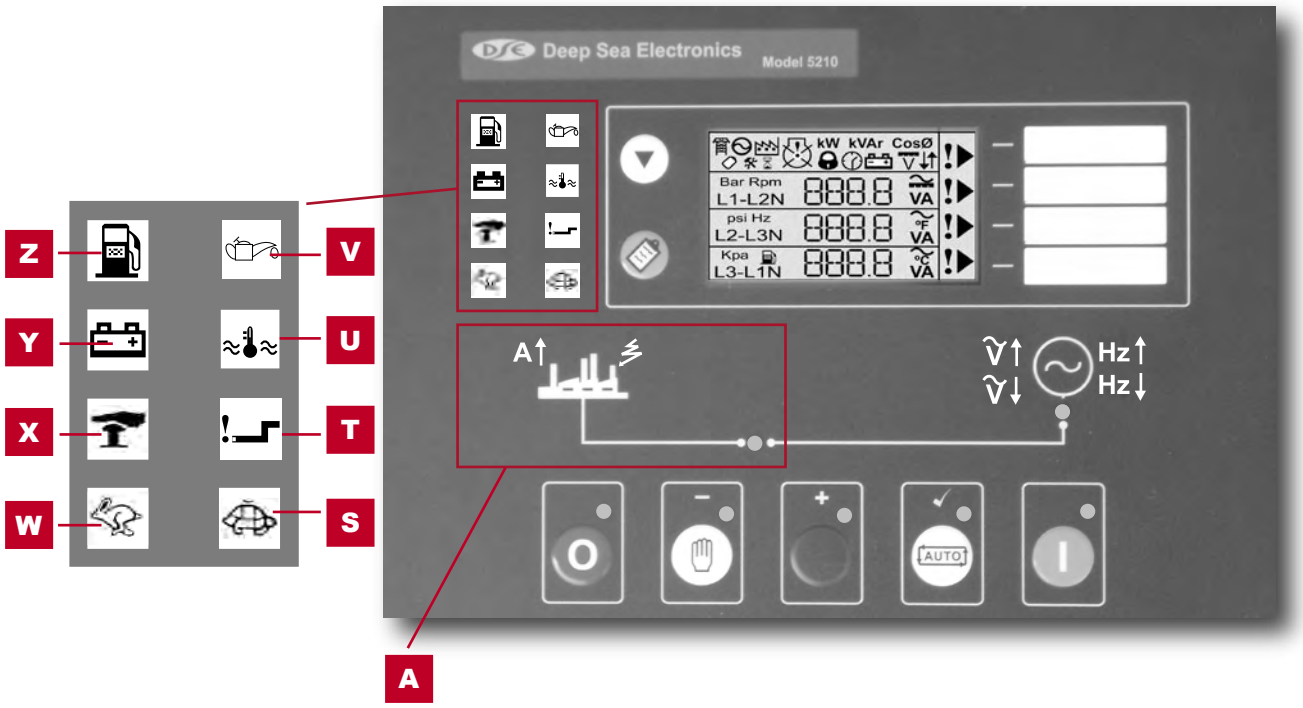
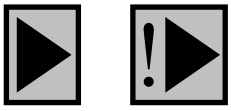
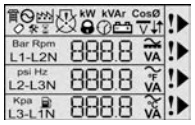
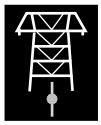


Image 21 - DEEP SEA 5210 CONTROL MODULE

NUMBER	SYMBOL	DESCRIPCIÓN	IDENTIFICATION
1		Stop button	Green LED
2		Button for switching to NO-LOAD TEST mode	Green LED
3		Button for switching to LOAD TEST mode	Green LED (available on model 5220 only)
4		Button for switching to AUTOMATIC mode	Green LED
5		Button for starting up generator set	In manual mode
6		If turned on, indicates that generator set is ready	Green LED
7		Configurable LCD indicators	
8		Screen indicating the status of the generator set	
9		Down button on the screen menu	
10		Event Log button	
11		LED turned on: mains power available	Green LED (available on model 5220 only)
12		Status of ATS for mains and generator set	Left LED indicator: mains closed / Right LED indicator: Generator closed
A		Status of the generator set	LED turned on: Generator set supplying consumers

The Deep Sea 5220 control module is an automatic module that controls the main power supply; if a mains failure occurs, generator set will start up. Loads are transferred when the mains supply fails. This control module also gives the option of manual startup. The user can also control all of the generator unit's parameters as well as the status of mains power supply. This module is supplied with automatic generator set with or without ATS.

The Deep Sea 5210 control module is supplied in "standby by signal" type units.

- **AUTOMATIC mode (AUTO):**

This is the normal operating mode.

Automatic mode will be activated by pressing the button (4). The LED at the top of the button will turn on, indicating that it is operational.

(5220) If the mains power supply fails for longer than the unit's programmed period, the LED (11) indicating that the mains power is available will be turned off.

(5210) If a mains failure occurs, the external management system should send a startup signal to the generator set, at which point the LED indicating remote startup active (7) turns on and the startup process of the generator set begins.

Once the generator unit is up and running, the display (6) lights up.

If a startup failure occurs, there will be a maximum number of startup attempts (3); after three failed startup attempts, the flashing stop signal will appear along with the startup failure indicator

When mains power is restored (or when the remote startup signal disappears) there will be a period of time in which the engine will continue operating at no load to cool down before stopping completely.

If a mains failure occurs during the no-load operating period (cool-down period), the generator set would begin the startup process again.

Press (1) or the emergency stop button to intentionally stop the unit.

- **NO-LOAD TEST mode (Manual):**

The no-load test mode is activated by pressing the button (2), at which point the LED at the top of the button (2) will turn on, indicating that it is operational.

Press (5) to start up the unit.

If a mains failure occurs or a remote startup signal is received, loads will be transferred to the generator set. (5220, the unit will continue operating with a load, regardless of the status of the mains power supply).

To terminate this mode, press the button (4).

Once button (4) is pressed and there is adequate mains power supply (without the remote startup signal activated), the shutdown sequence will begin as described in the automatic mode.

Press (1) or the emergency stop button to intentionally stop the unit.

- **LOAD TEST mode (Manual):**

Select by pressing (3). Test to check proper functioning of the generator set.

To start up, press the start button (5).

In this operating mode, a mains failure is simulated, with the loads being transferred to the generator set.

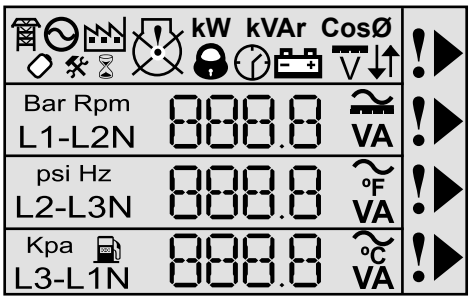
To terminate this mode, press the button (4).

Once button (4) is pressed and there is adequate mains power supply (without the remote startup signal activated), the shutdown sequence will begin as described in the automatic mode. After this period of time, the load will be carried by the mains power.

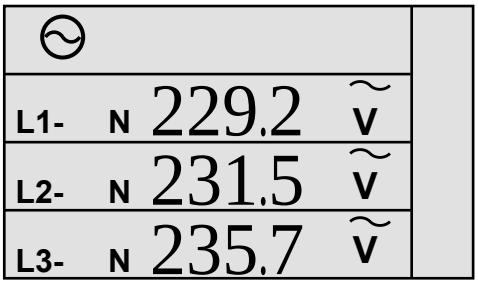
Press (1) or the emergency stop button to intentionally stop the unit.

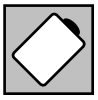
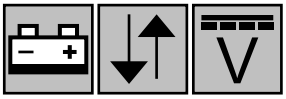
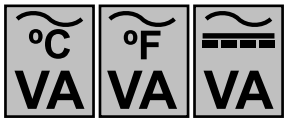
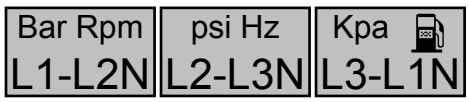
The status screen of the Deep Sea 52XX control module will indicate all of the possible events of the generator set.

This image shows all of the indications of the LCD screen (8).



The LCD screen (8) will normally look similar to this:
Example of the screen indicating the voltage readings for each phase of the generator set.

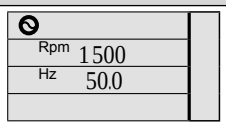
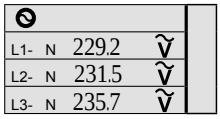
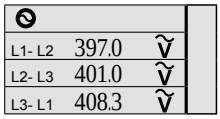


ICON	DESCRIPTION
	Indicates that the screen display information refers to the mains power.
	Indicates that the screen display information refers to the generator set.
	Indicates that the event log reading is being accessed (Flashing).
	Indicates that the programming mode is being accessed.
	Indicates that the generator set is idle.
	Indicates that the generator's set system date and time is being shown.
	This icon indicates a stoppage or alarm: Warning = , Stoppage =
	Indicates fuel level in percentage.
	Indication related to the battery.
	Indicate battery level outside established limits.
	Indicates keypad is locked.
	KW and kVAr indicate units of current power. CosØ: Indicates power factor.
	º C: Measurement given in degrees celsius. º F: Measurement given in degrees Fahrenheit. ~ : Measurement related to alternating current. V : Measurement of voltage. A : Measurement of intensity (Amperes). ⎓: Indicates direct current.
	If Lx-Lx is displayed: Indicates measurement of phase-phase voltage. If Lx-N is displayed: Indicates measurement of phase-neutral voltage. Bar, rpm, PSI, Hz, kPa: Indicate measurement units for the corresponding parameter. The lock icon indicates keypad is locked.

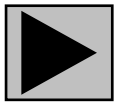
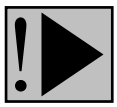
To view the values of the various parameters, press ▼ and the LCD indicator (8) will display the items listed below in the following order:

- RPM of generator / frequency (Hz)
- Line-Neutral AC voltage of generator
- Line-Line AC v oltage of generator
- Oil pressure
- Coolant temperature
- Fuel level (%)
- Engine operating hours
- DC voltage of battery
- AC line current
- Total kW
- Voltage (V)
- Intensity (A)
- Phase angle (cos)
- Supply frequency (Hz)
- Phase-Neutral AC supply voltage (normal)
- Phase-Phase AC supply voltage (normal)

The following is an example of what the LCD screen (8) will look like when the various parameters are checked:

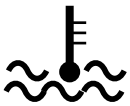
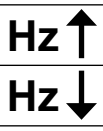
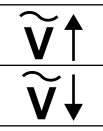
SCREEN SEQUENCE	DESCRIPTION
	Initial screen in which engine speed and generator frequency are measured. To measure the next parameter, press ▼
	Then the second measurement screen appears, indicating the voltage readings between each phase and neutral. To measure the next parameter, press ▼
	The third measurement screen will appear, indicating the voltage readings between phases. To measure the next parameter, press ▼

Pressing ▼ afterwards, we move from one parameter to the next in the order specified on the previous page.

WARNING/STOP	DESCRIPTION
	Indicates status of the configurable input.
	Illuminates to indicate an alarm configured in combination with these icons: Warning = , Stoppage =
	LCD screen will appear as follows when a configurable alarm is activated.

ALARMS:

The following chart describes each alarm:

NUMBER	SYMBOL	DESCRIPTION
Z		Fuel below minimum level.
Y		Low battery voltage.
X		Emergency stop.
W		Engine overspeed.
V		Low oil pressure.
U		High engine temperature.
T		If engine does not start after three attempts, the unit will stop and this icon will be displayed.
S		Low engine speed.
H		Alternator frequency outside established limits.
V		Alternator voltage outside established limits.
A		If it is detected during a long period of time that the generator's output current exceeds the established value, the following warning will be displayed. If the cutoff point for overcurrent is exceeded by 10% for one hour, the unit will be stopped.

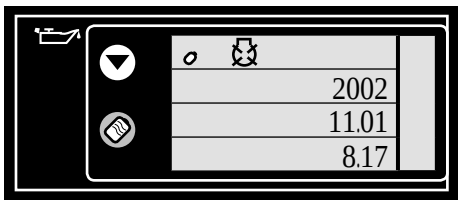
Note: If the established limits defined as warning or stop are exceeded, the module will display the corresponding alarm. None of these will be shown if not detected by the system.

Note: The Deep Sea 52XX module will show a Warning displaying this icon *as well as the identifying alarm icon. If the warning leads to the unit stopping, this icon will turn on* *as well as the corresponding icon, both of which will flash*

- Event log:

To view the event log, press the following button repeatedly (10).

This icon will flash .

A screen similar to this will be shown: 

"On November 1, 2002, at 08:17, the unit detected that the oil pressure was below the minimum level and has shut down the generator."

To move from one event to the next, press (9).

To exit the main screen, press (10).

Note: Warning alarms are not logged.

- Adjusting date and time:

The date and time are adjustable. When the battery is disconnected, the date and time are frozen; when the battery is reconnected, the date and time shown will be from the time the battery was disconnected.

The date and time reflected in the event log will be taken from the configuration according to the following steps:

Press (1) and (10) simultaneously. This icon will flash, indicating that "configuration mode" is active. The calendar will be shown.

Press (4) and the hour will start flashing.

To adjust to the desired setting, press (3) or (2).

Once the desired value has been set, press (4) to save.

LIST OF POSSIBLE INDICATORS:

1	Low pressure
2	High temperature
3	Fuel level (%)
4	Date / time
5	Mains transient delay
6	Start delay
7	Warming up
8	Crank attempt
9	Crank rest
10	Safety delay
11	Overspeed overshoot
12	Warming up
13	Transfer delay
14	Return delay
15	Cooling run

16	Energize to stop
17	Low battery voltage
18	High battery voltage
19	Low frequency
20	High frequency
21	Generator under voltage L1-N
22	Generator over voltage
23	Generator under frequency
24	Generator over frequency
25	Delayed overcurrent %
26	Under speed
27	Over speed
28	Generator low voltage
29	Generator high voltage
30	Charge alternator failure

6.5.- DEEP SEA 5310/5320 DIGITAL CONTROL MODULE

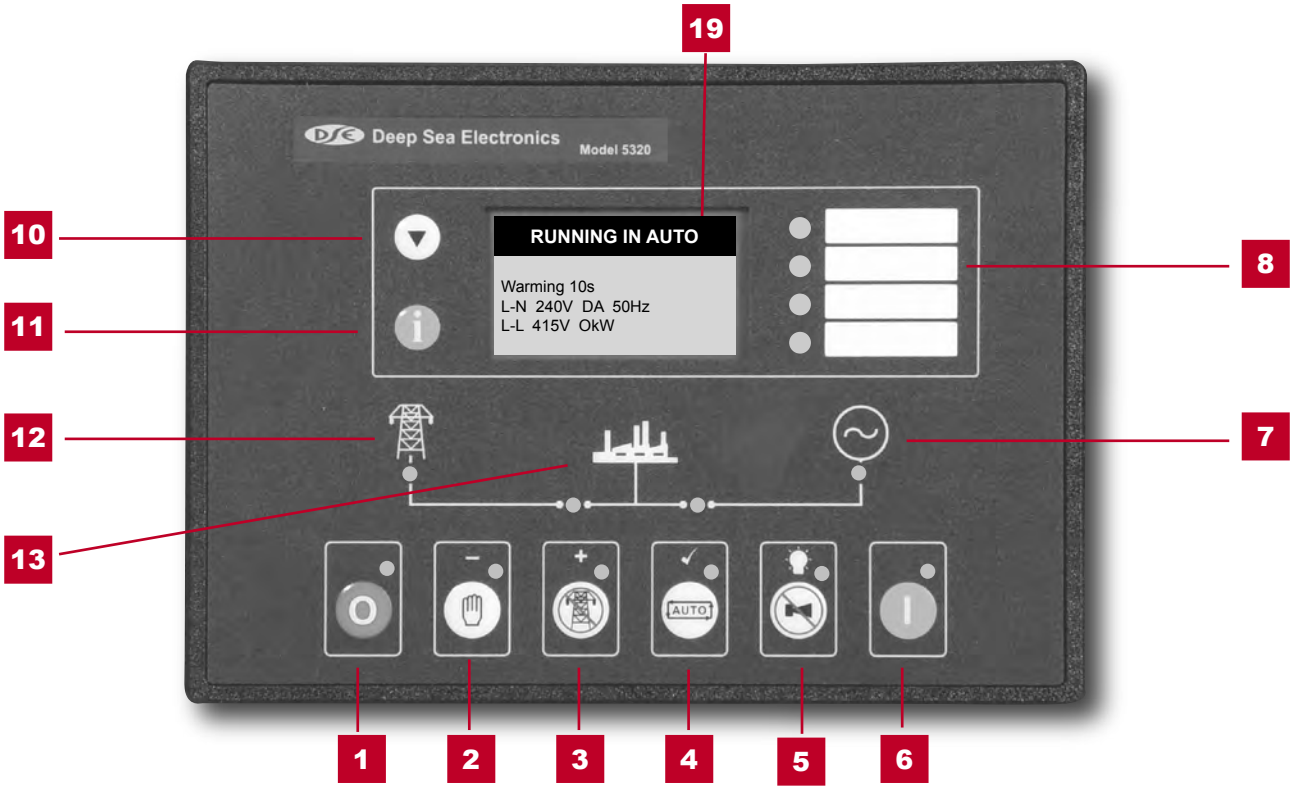


Image 22 - DEEP SEA 5320 CONTROL MODULE

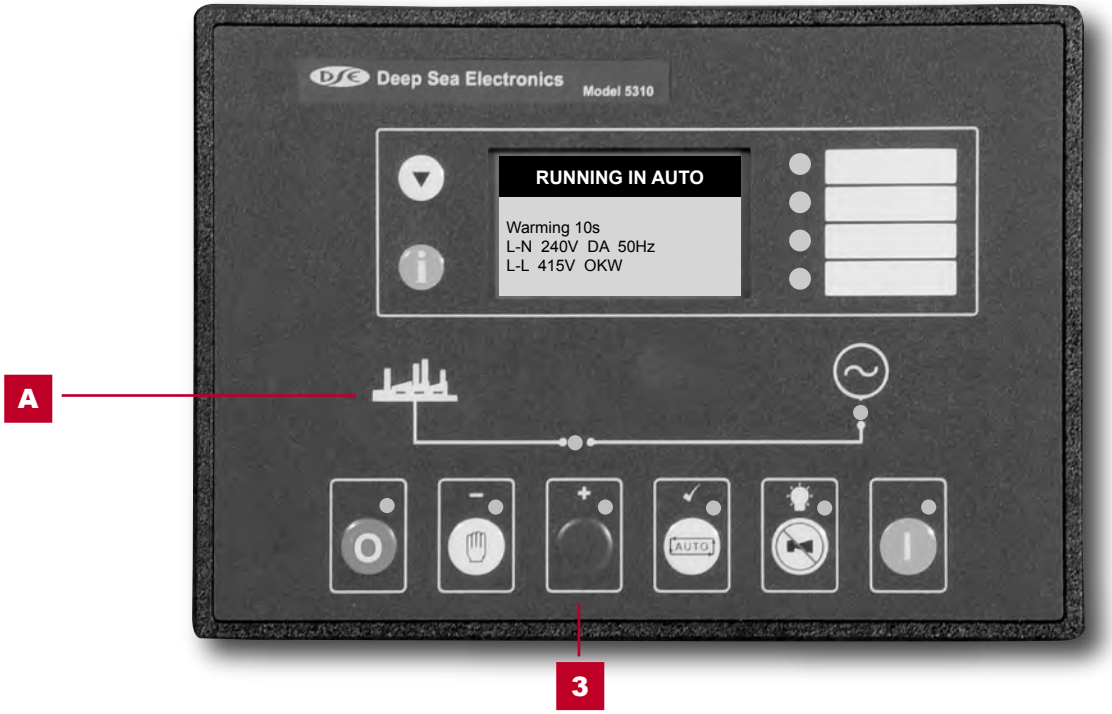
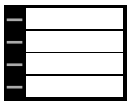
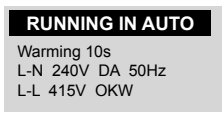


Image 23 - PLACA DE CONTROL DEEP SEA 5310

NUMBER	SYMBOL	DESCRIPTION	IDENTIFICATION
1		Stop button	Green LED
2		Button for switching to NO-LOAD TEST mode	Green LED
3		Button for switching to LOAD TEST mode	Green LED (available on model 5320 only)
4		Button for switching to AUTOMATIC mode	Green LED
5		Button to silence alarms / Control module LED test	Green LED
6		Button for starting up generator set	
7		Turned on when generator set is available	Green LED
8		Configurable LED indicators	Red LED
9		Screen indicating the status of the generator set	
10		Down button on the screen menu	
11		Button to scroll to next page of screen menu	
12		LED lit: Mains power available	Green LED (available on model 5320 only)
13		Status of ATS for mains and generator set	Left LED indicator: mains closed / Right LED indicator: Generator closed
A		Status of the electrical	LED lit: Generator set is supplying loads for consumers

Deep Sea 5320 control module is an automatic module that controls the main power supply; if a mains failure occurs, generator set will start up. Loads are transferred once the mains supply fails. This control module also gives the option of manual startup. The user can also control all of the generator unit's parameters as well as the status of mains power supply.

- **AUTOMATIC mode (AUTO):**

This is the normal operating mode.

The automatic mode is activated by pressing the button

(4)), at which point the LED at the top of the button (2) will turn on, indicating that it is operational.

(5320) If the mains power supply fails for longer than the unit's programmed period, the LED (12) indicating that the mains power is available will be turned off.

(5310) If a mains failure occurs, the external management system should send a startup signal to the generator set, at which point the LED indicating remote startup active (7) turns on and the startup process of the generator set begins.

The engine will start; if it should fail, there will be a maximum number of startup attempts (3). If all three startup attempts have been unsuccessful, the information screen will display a startup alarm:

When mains power is restored (or when the remote startup signal disappears) there will be a period of time in which the engine will continue operating at no load to cool down before stopping completely.

If a mains failure occurs during the no-load operating period (cool-down period), the generator set would begin the startup process again.

Press (1) or the emergency stop button to intentionally stop the unit.

- **NO-LOAD TEST mode (Manual):**

The no-load Test mode is activated by pressing the button (2), at which point the LED at the top of the button will turn on, indicating that it is operational.

Press (6) to start up the unit.

If a mains failure occurs or a remote startup signal is received, loads will be transferred to the generator set. (5320, the unit will continue operating with a load, regardless of the status of the mains power supply)

To terminate this mode, press the button

(4).

Once button (4) is pressed and there is adequate mains power supply (without the remote startup signal activated), the shutdown sequence will begin as described in the automatic mode.

Press (1) or the emergency stop button to intentionally stop the unit.

- **LOAD TEST mode (Manual):**

(5320) Select by pressing (3). Test for proper functioning of the generator set.

To start up, press the start button (6).

In this operating mode, a mains failure is simulated, with the loads being transferred to the generator set.

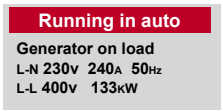
To terminate this mode, press the button (4).

Once button (4) is pressed and there is adequate mains power supply (without the remote startup signal activated), the shutdown sequence will begin as described in the automatic mode. After this period of time, the load will be carried by the mains power.

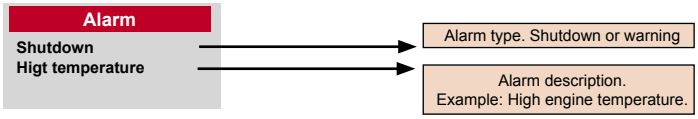
Press (1) or the emergency stop button to intentionally stop the unit.

ALARMS:

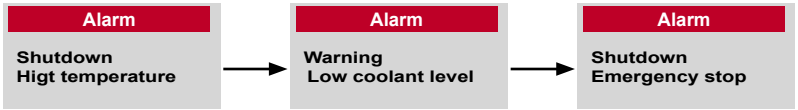
Press (5) to silence the audible alarm and the common alarm LED.



the screen will display the following:



If shutdown occurs while a warning is active, the screen will cycle through the active alarms:



The alarms do not entail generator unit shutdown.

INCIDENT	ALARM DESCRIPTIONS
ALARM **Warning** **Charge fail**	Alternator voltage not detected
ALARM **Warning** **Low battery volts** **ALARM** **Warning** **High battery volts**	Battery voltage beyond established limits
ALARM **Fail to stop**	After shutdown command, engine continues running. Could also indicate faulty oil pressure sender
ALARM **Warning** **Low fuel level**	Fuel level below established limits
ALARM **Warning** **Low oil pressure**	Low oil pressure, below established limit
ALARM **Warning** **High temperature** **ALARM** **Warning** **Low coolant temp**	Engine temperature beyond established limits
ALARM **Warning** **Overspeed** **ALARM** **Warning** **Underspeed**	Engine speed beyond established limits
ALARM **Warning** **Over frequency** **ALARM** **Warning** **Under frequency**	Alternator frequency beyond established limits
ALARM **Warning** **AC overvolts** **ALARM** **Warning** **AC undervolts**	Alternator voltage beyond established limit
ALARM **Warning** **High current**	Intensity of the alternator output beyond established limits

INCIDENT	DESCRIPTION OF SHUTDOWNS
ALARM **Shutdown** **Failed to start**	Engine does not start, three attempts made
ALARM **Shutdown** **Emergency stop**	Controlled shutdown of the unit. It will not be functional until the emergency stop button has been reset
ALARM **Shutdown** **Low oil pressure**	Oil pressure below established limit
ALARM **Shutdown** **High temperature**	Engine temperature above established limit
ALARM **Shutdown** **Overspeed** **ALARM** **Shutdown** **Underspeed**	Engine speed beyond established limits
ALARM **Shutdown** **Over frequency** **ALARM** **Shutdown** **Under frequency**	Alternator frequency beyond established limits
ALARM **Shutdown** **AC overvolts** **ALARM** **Shutdown** **AC undervolts**	Alternator voltage beyond established limit
ALARM **Shutdown** **Oil pressure sender fault**	Faulty oil pressure sender
ALARM **Shutdown** **High current trip**	Intensity of the alternator output beyond established limits

Note: If the established limit for shutdown is exceeded, a corresponding alarm screen will be displayed and on the configurable LED indicator (8) the common shutdown alarm will appear.

- **Typical LCD display screens**

Waiting in auto
Mains on load

Indicates that the generator set will respond to either a mains failure or an active remote start

Starting in auto 10s
Mains on load Cranking attempt 1

Indicates that generator set is in automatic mode and has been initiated after a mains failure has been detected.

Running in auto
Generator on load L-N 230V 240A 50Hz L-L 440V 133kW

Indicates generator set running normally in automatic mode. Also indicates the average line to neutral voltage (L-N), the highest of the three phase currents, the nominal frequency, average line-to-line voltage (L-L) and total kilowatts.

- **Measurement parameter display screens:**

Coolant temperature
60 ºC 140 ºF

Coolant temperature in degrees (ºC) celsius and degrees Fahrenheit (ºF).

Oil pressure
6 Bar 87 PSI 600 kPa

Displays engine oil pressure in Bar, PSI and kPa.

Generator amps		
L1	L2	L3
238	241	241

All three generator line currents.

- **Event log:**

Lo view the event log, press the following button repeatedly

Register of shutdown alarms occurring in the generator unit; the most recent occurrences can be stored. A screen similar to this is shown:

Event log 21:15:00
10 th september 2003 Low oil pressure Shutdown

"On September 10, 2003, at 21:15, the unit detected that the oil pressure was below the minimum level and has shut down the generator."

To move from one event to the next, press

To exit the main screen, press

Note: Warning alarms are not logged.

- **Displaying information:**

Pressing this button:

Page order:

- Status display.
- Instrument display.
- Alarms display.
- Event log.

It is possible to scroll through the different display screens by pressing the next page button: Once selected, the instrument will remain on the screen until the user selects a different instrument or after a period of inactivity for the control module, at which point the default display appears.

Alternatively, by holding down on the user can autoscroll through all the instruments on a particular screen.

To disable scroll, stop pressing the page down button and press it again for a few seconds or press . When autoscroll is disabled, if no buttons are pressed the display will return to the alarms page.

If an alarm becomes activated while viewing instruments, the alarms page will be automatically displayed.

Instrument page content:

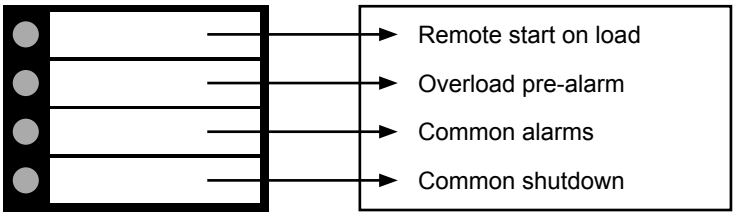
- Engine speed.
- Oil pressure.
- Coolant temperature.
- Engine hours run.
- Number of starts.
- DC battery voltage.
- Generator AC voltage L-N.
- Generator AC voltage L-L.
- Generator Line Current.
- Fuel level (%).
- Nominal voltage L-N.
- Nominal voltage L-L.
- Nominal frequency (Hz).

If the following appears in an instrument display: *****, this means that the engine cannot provide this parameter; the control module, however, does provide this option.

If the following appears in an instrument display: ####### with the generator set in OFF/AUTOMATIC mode (with the engine stopped), this means that the control module is not connected to the engine.

Press this button (6) to display the given value.

- **Alarm LED:**



- **Editing the current date and time:**

The date and time are adjustable. When the battery is disconnected, the date and time are frozen; when the battery is reconnected, the date and time shown will be from the time the battery was disconnected.

The date and time reflected in the event log will be taken from the configuration according to the following steps:

Press and simultaneously, then enter the correct PIN number.

Press until the date and time screen appears.

When date and time screen appears, press the button. The minutes will start to flash.

Press or to adjust to the desired value.

Press the button to confirm the value entered. The hour will begin to flash; press or again to adjust to the desired value.

Press the button to confirm the value entered and select the day. The day will begin to flash; press or again to adjust to the desired value.

Press the button to confirm the selection made and select the month. The value will start to flash; press or again to adjust the month.

To input the year, press . The year will start to flash; press or to adjust to the desired value.

Press to save the changes made to date and time.

The screen will display the date and time entered. →

Date and time
19 Sep 2003 10:00

6.6.- INTELIGEN DIGITAL CONTROL MODULE

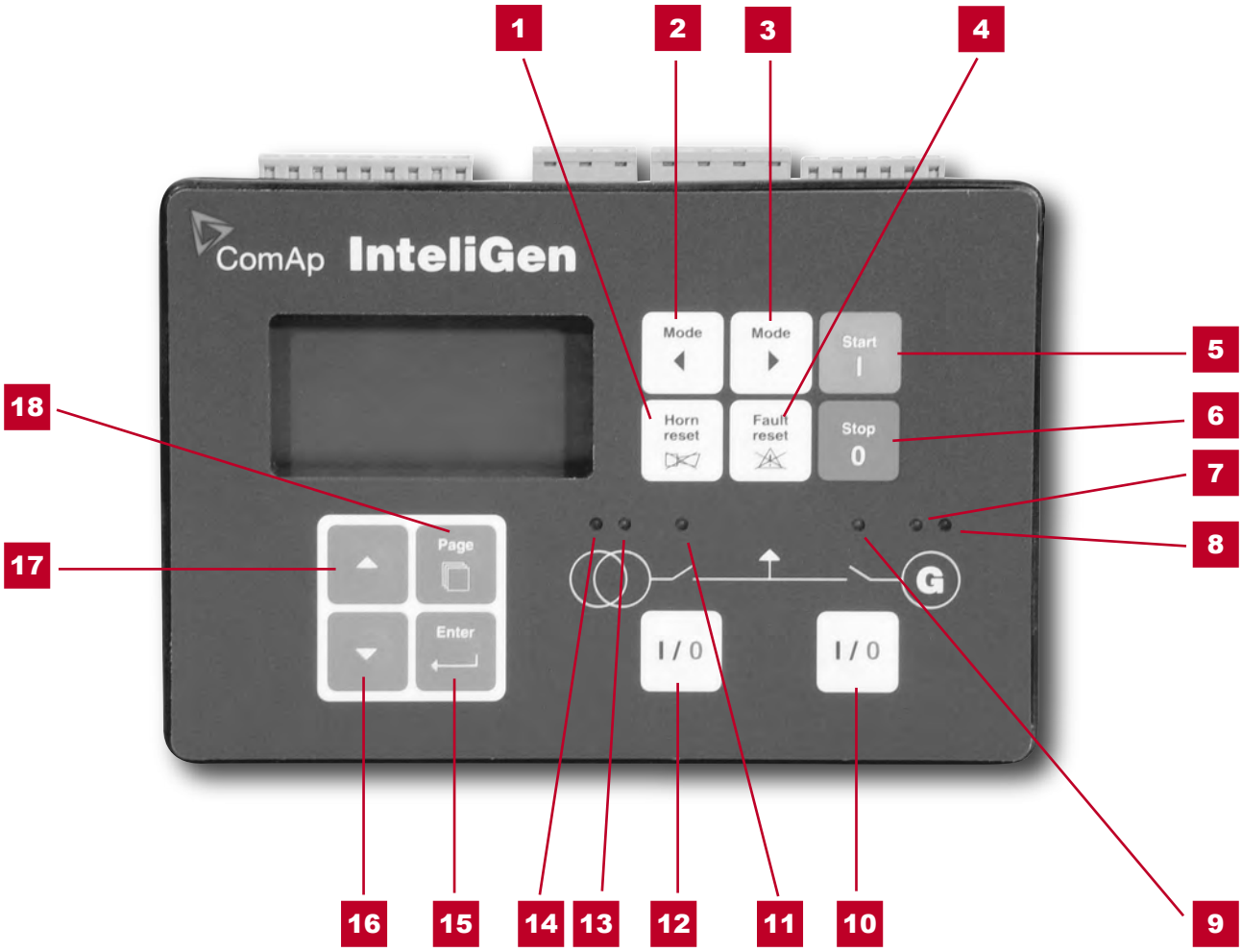
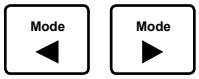
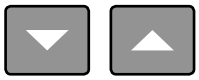


Image 24 - INTELIGEN DIGITAL CONTROL MODULE

NUM.	SYMBOL	DESCRIPTION	IDENTIFICATION
1		Deactivates audible alarm	
2		Scrolls through different operating modes	OFF←MAN←AUT←TEST
3			OFF→MAN→AUT→TEST
4		Fault reset	Acknowledges faults and alarms
5		Start button	In manual mode
6		Stop button	In manual mode
7		Generator voltage present	Green if unit voltage is present and within limits. Flashes during synchronization with mains.
8		Generator set failure	Flashing Red LED indicates alarm
9		State of GCB	Green → GCB is closed. Flashes during synchronization with mains
10		GCB ON/OFF	Opens and closes GCB in manual mode
11		State of MCB	Green is MCB is closed flashes during synchronization with mains.
12		MCB ON/OFF	Opens and closes MCB in manual mode
13		State of mains power	Green if mains power correct
14		State of voltage supplied to consumers	Red light flashes if mains failure occurs and generator stops; continuous if generator is operating, turns off when mains power restored..
15		Enter button	Confirms on-screen value
16		Selects on-screen value	Increases value
17			Decreases value
18		Button to cycle through the menus	Cycles through display screens →MEASUREMENT →ADJUSTMENT →HISTORY

NOTE: GCB = Generator circuit breaker; MCB = Mains circuit breaker.

The **InteliGen** module contains the following three menu screens:

- Measurement
- Adjustment
- History

} Can be selected using the following button:

(18).

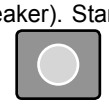
To display the different instruments on each screen menu, press (17) and (16).

The measurement screen displays the parameters measured by the engine; if the engine uses an electronic management system, many additional parameters can be displayed. In addition to these parameters, measurements can be displayed for fuel level, oil pressure, current, voltage, frequency, run hours and battery charge level.

The adjustment menu screen displays the adjustment parameters already configured; it is not necessary to edit any of these.

The history screen menu displays the log of alarms that have occurred in the generator unit. It also logs the opening and closing of the mains circuit breaker as well as the starting and shutting down of the generator unit.

• AUTOMATIC mode (AUTO):

If a mains failure is detected, the InteliGen module will open the MCB (main circuit breaker). Startup command is issued to generator set. If generator voltage is within the established limits, the following LED  (7) will be lit and the controller closes the GCB (generator circuit breaker). Once mains power has been restored, synchronization between mains and generator occurs; then the MCB is closed, causing the generator to discharge, followed by the opening of the GCB. When mains power is restored, there will be a period of time during which the engine continues operating at no load to cool down before stopping completely.

Not

• NO-LOAD TEST mode (Manual):

Press the START button

(5) to start up the generator set. When the generator voltage is within the established limits, the LED indicator (7) will be lit. Next press the GCB ON/OFF button

(10). The loads will be transferred directly to the generator set. To stop the unit, press STOP

(6).

• LOAD TEST mode (Manual):

This operating mode is used to allow the generator set to check the state of the mains power or to disconnect from the mains when an imminent mains failure is detected. When this operating mode is selected, the unit starts up at no load. To transfer the loads to the unit, press the MCB ON/OFF button

and after press the GCB

(12). At this time synchronization occurs between the generator set and the mains for 60 seconds to assume the loads.

• OFF mode:

The generator set will not start. Even if we press the buttons START

(5), STOP (6), GCB ON/OFF (10), the generator will not respond.

ALARMS:

The InteliGen control module includes the following warnings:

INCIDENT	STORED IN HISTORY RECORD
Startup sequence initiated	Startup of Gen-Set
Shutdown of the Gen-Set	Gen-Set stopsv
Generator set circuit breaker closed	GCB connected
Generator set circuit breaker opened	GCB disconnected
Some GCB in group was opened (in MINT)	Other GCB trip
Mains circuit breaker closed	MCB connected
Mains circuit breaker opened	MCB disconnected
Time mode has been changed	TimeModeChngd
STARTUP INFO	
AMF startup	GenSetMF start
AMF stop	GenSetMF stop
Remote startup by binary input (SPM, SPtM)	GenSetRemStart
Remote stop by binary input (SPM, SPtM)	GenSetRemStop
System startup by binary input (MINT, MEXT)	GenSetSysStart
System stop by binary input (MINT, MEXT)	GenSetSysStop
Peak start (SPtM)	GenSet PKstart
Peak stop (SPtM)	GenSet PKstop

ENGINE		
EVENT SPECIFICATION	**ALARM**	**HISTORY**
Generator set startup failure	Sd start Fail	Sd start Fail
Generator set overspeed	Sd overspeed	Sd overspeed
Generator set underspeed	Sd underspeed	Sd underspeed
SD stop fail	Sd stop fail	Sd stop fail
Emergency stop	Emergency stop	Emergency Stop
RPM pickup fail	Sd pickup fail	Sd pickup fail
Battery voltage warning	Wrn batt volt	Wrn batt volt
Battery is discharged	Sd batt flat	0

GENERATOR	
EVENT SPECIFICATION	**EVENTS RECORDED**
Generator phase 1 overvoltage	Unl vg1 over
Generator phase 1 undervoltage	Unl vg1 under
Generator phase 2 overvoltage	Unl vg2 over
Generator phase 2 undervoltage	Unl vg2 under
Generator phase 3 overvoltage	Unl vg3 over
Generator phase 3 undervoltage	Unl vg3 under
Generator overfrequency	Unl fgen over
Generator underfrequency	Unl fgen under
Generator voltage unbalance	Unl vgen unbal
Generator overload	Unl gen overload
Load surge protection	Load surge
Reverse power	Unl rev PWR
Synchronization timeout	Stp sync to
Ground fault protection	Unl earthFltC
Failure of generator circuit breaker	GCB fail
Generator short circuit protection	Unl short igen
Generator IDMT protection	Unl IDMT
Generator current unbalance	Unl igen unbal
Voltage on mains terminals (SPM)	Unl counter volt
Bus voltage error (MINT)	Unl bus meas err

PHASE SEQUENCE		
EVENT SPECIFICATION	**ALARM**	**EVENTS RECORDED**
Generator phase L1 is inverted	GEN L1 neg	0
Generator phase L2 is inverted	GEN L2 neg	0
Generator phase L3 is inverted	GEN L3 neg	0
Wrong generator phase sequence	G ph opposed	0
Wrong generator phase sequence and phase L1 is inverted	G ph + L1 neg	0
Wrong generator phase sequence and phase L2 is inverted	G ph + L2 neg	0
Wrong generator phase sequence and phase L3 is inverted	G ph + L3 neg	0
Mains phase L1 is inverted	B L1 neg	0
Mains phase L2 is inverted	B L2 neg	0
Mains phase L3 is inverted	B L3 neg	0
Wrong mains phase sequence	B ph opposed	0
Wrong mains phase sequence and phase L1 is inverted	B ph + L1 neg	0
Wrong mains phase sequence and phase L2 is inverted	B ph + L2 neg	0
Wrong mains phase sequence and phase L3 is inverted	B ph + L3 neg	0

7.- MAINTENANCE OF ELECTRICAL GENERATOR

You must make sure that the person who will perform this duty is qualified to do so and utilizes the appropriate individual protection equipment.

7.1.- PRIOR TO MAINTENANCE

You must first:

- Switch control module to the OFF position.
- Press the emergency stop button.
- Disconnect the battery; use the battery shutoff switch.

To cut mains voltage, disconnect the 10 A. electromagnetic circuit breaker in the ATS panel supplied by GRUPOS ELECTRÓGENOS GESAN, S.A. If made by another manufacturer, make sure that this cut is done properly before handling the unit.

7.2.- DURING MAINTENANCE

Preventive maintenance tasks are necessary to preserve the unit; doing so will result in optimum performance. Be sure to verify the following items:

1) While the engine is cold, the oil level should be between the minimum and maximum values. If it is below the minimum, add engine oil.
   NOTE: With the GPM-2 and INTELIGEN modules, at 50 hours run notice will be given to change the oil. The recommended oil is 15W40.
2) The radiator water level should be adequate.
3) The fuel level in the tank should be sufficient for the service to be performed. The generator control panel is equipped with a fuel gauge, which will be functional whenever the electrical panel is receiving power.
4) Always refuel in a well ventilated area with the engine stopped.
5) Closely inspect the connections and the electrical circuit, for both the mechanical and electrical sections.
6) Check carefully for possible liquid leaks. If a leak is detected, find its source and resolve the problem. If your unit has a drip pan, drain the pan (see section on DRIP PAN).
7) The air inlet and outlet vents should be completely unobstructed to allow for free circulation of cooling air.
8) Check the state of the unit's radiator and clean if necessary.
9) Make sure the exhaust tube is not obstructed.
10) Check the battery's connection terminals and electrolyte level (if necessary, add demineralized or distilled water). Acid should never be added. The battery should be recharged if the terminal voltage is below 12.3 V.
11) If the battery needs recharging after being taken out of the unit, remove the vent caps and charge battery with direct current only. Connect the charger's positive (+) cable to the battery's positive (+) terminal and the charger's negative (-) cable to the battery's negative (-) terminal. Recharge battery with a current equivalent to 1/10 the nominal capacity (Ah). Battery is fully charged when acid density is 1.28. Before completing recharging process: turn off charger before disconnecting battery and check electrolyte level.
12) If the battery is discharged and you want to perform an emergency startup with the battery from another generator, first check the tightness of the discharged battery's terminals. Stop the engines of both units and connect the two positive terminals of the batteries first and then connect the negative terminal of the charged battery to a metal area on the disabled unit (ground). Start up the auxiliary unit and then the unit being repaired. Disconnect the cables in reverse order to avoid a short circuit. Finally, fully charge the battery.

While performing preventive maintenance tasks it is advisable to wear protective eyewear and gloves during all operations involving □

Remember to always perform all operations with the utmost precaution and safety as indicated in this manual. (Pay special attention to the risk of short circuits that could be caused by coming in contact with the unit's metallic objects.)

7.3.- MAINTENANCE CHART

FREQUENCY	MAINTENANCE OPERATION
MONTHLY	Perform a mains failure simulation; the unit should supply power to consumers for one hour.
	For parallel units, check the connection and the load sharing.
	Review the connections of the startup battery, clean and cover with vaseline.
	Make sure the battery charger is functioning properly.
	Make sure fuel pump is functioning properly.
	Check fuel level on the main fuel tank.
	Check coolant and oil levels.
	Make sure smoke extractor is functioning properly.
	Make sure all of the electrical panel lights are functioning properly.
	Make sure the ATS functions properly in transfers.
	Check the state of all of the gauges and indicators on the electrical panel.
	Check the engine manufacturer's manual for specific tasks.
EVERY 6 MONTHS	Start up the engine manually three times, noting each time the voltage and density readings for each of the battery's elements. If any of the voltage readings varies significantly from those of the battery's other elements, do not perform the remaining manual engine startups.
	Fully charge the battery and check the electrolyte level.
	Make sure there are no leaks in the coolant tubes.
	Make sure that all of the unit's alarms display correctly.
	Check the engine manufacturer's manual for specific tasks.
YEARLY	Clean the outside of the fuel tank and check the diesel lines.
	Clean radiator, change antifreeze.
	Clean and lube the water pump and fan.
	Make sure the control apparatus measurements given are correct.
	Clean control panel and tighten the panel's connections.
	Verify that the antivibration feet, fittings and belts are in proper condition.
	Make sure that vibration and noise levels comply with the current regulations.
	Make sure noise emission level is compliant with the current regulations.
	Check the engine manufacturer's manual for specific tasks.
EVERY 3 YEARS	Replace startup batteries.

8.- TROUBLESHOOTING

INCIDENT			LIKELY CAUSE	SOLUTION
IN THE ELECTRICAL PANEL	Engine does not start	Starter does not turn	1.-Defective battery	1.-Replace battery
				2.-Replace starting system
			2.-Defective starting system	3.-Contact technical svcs
		Starter functioning properly	1.-Faulty voltage detector on control module	1.-Contact technical svcs
			2.-Low fuel level	2.-Refill fuel tank
	Engine starts	Stops with cause	1.-Emergency has occurred	1.-Take appropriate measures
		Stops for no apparent reason	1.-Emergency not indicated due to faulty LED indicator	1.-Contact technical svcs
		Does not stop when emergency occurs	1.-Defective stopping system	1.-Press emergency stop button
				2.-Contact technical svcs
		Generator does not stop when in stop position	1.-Faulty control unit	1.-Press emergency stop button
			2.-Defective stopping system	2.-Contact technical svcs
ORIGINATING IN ENGINE'S INTERIOR	Unit in operation	High voltage at no load	1.-Overspeed	1.-Contact technical svcs
			2.-Alternator failure	
		Low voltage at no load	1.-Underspeed	1.-Contact technical svcs
			2.-Alternator failure	
		Correct voltage but low when on load	1.-Heavy load	1.-Adjust unit's loads
			2.-Underspeed on load	2.-Contact technical svcs
			3.-Alternator failure	
		Voltage unstable	1.-Voltage meter damaged	1.-Contact technical svcs
			2.-Engine unsteady	
			3.-AVR damaged	
		Strange noise inside the unit	1.-Various causes	1.-Make sure nothing is preventing the unit from functioning properly
				2.-Contact technical sSvcs

9.- PROTECTION FROM THE ENVIRONMENT

Once the generator set has been installed, it is necessary to clean the packaging, accessories, electrical tools, etc., that were used during the installation process.

When it is time to dispose of the batteries, in keeping with environmental regulations it is advisable to take them to an authorized recycling center.

For a cleaner environment, recycle all possible items and be sure to not throw electrical components in with the regular garbage so as to comply with european directive 2002/96/EC. These items should be stored separately until being taken for ecological recycling.

10.- WARRANTY

The generator set warranty covers an entire year, starting from the date it is installed. This should be communicated to GRUPOS ELECTRÓGENOS GESAN, S.A. (hereinafter “the manufacturer”), in writing, via fax or email. The following information must be included: MODEL, SERIAL NUMBER and INSTALLATION DATE.

If the manufacturer is not informed of the installation within a maximum of sixty days from the invoice date, the latter shall be considered the effective start date of the warranty period. If for any reason the installation is not possible within the first sixty days following the invoice date, the manufacturer must be informed thereof in writing. Thus no warranty claims shall be accepted if the manufacturer is not in possession of the aforementioned correspondence.

The warranty of the generator set will cover any faulty components or assembly not caused by improper use, handling or modification. The warranty does not cover breakdowns caused by connecting the generator set to devices not installed or supplied by the manufacturer. Also excluded are breakdowns and damages caused by prolonged or improper storage; should this occur, please see the manufacturer’s user manuals.

The warranty for the generator set shall cover ONLY the replacement parts and labor necessary for the repair of the generator by personnel authorized by the manufacturer. Traveling, kilometers traveled and other expenses deriving from the repair of a generator under warranty are excluded from the warranty coverage and in no case shall the manufacturer be responsible for these covering these expenses, which shall be paid in cash.

The decision to accept or reject a warranty shall be made by the manufacturer. In the case of engine and alternator breakdowns, the warranty shall be granted by the provider of said components, according to the particular warranty conditions of those components. The manufacturer reserves the option to request that the faulty element be returned. In such case, all costs related to said return shall be covered by the customer.

The warranty for a repair made during the warranty period shall have the same expiration date as the warranty for the generator set.

The warranty does not cover damage caused by terrorist attacks, natural disasters, sabotage or incidents of a similar nature.

If any of the provisions set out does not comply with the legislation of a certain country, the importer is required to notify the manufacturer thereof prior to carrying out the sale transaction.

11.- NOISE LEVEL

GESAN Electrical Generators produce different acoustic levels depending on the output and soundproofing of the generator set. The noise output is indicated on a sticker affixed to the unit's base frame.

Note: If you work near the unit for any extended period of time, it is advisable to use hearing protection.

12.- DECLARATION OF CONFORMITY CE

GRUPOS ELECTRÓGENOS GESAN, S.A., shall deliver a CE "Declaration of Conformity" form along with the unit, in compliance with the referenced regulations or standardized documents.

13.- APPENDIX 1: FIGURES

Detail of the unit's Identification label:

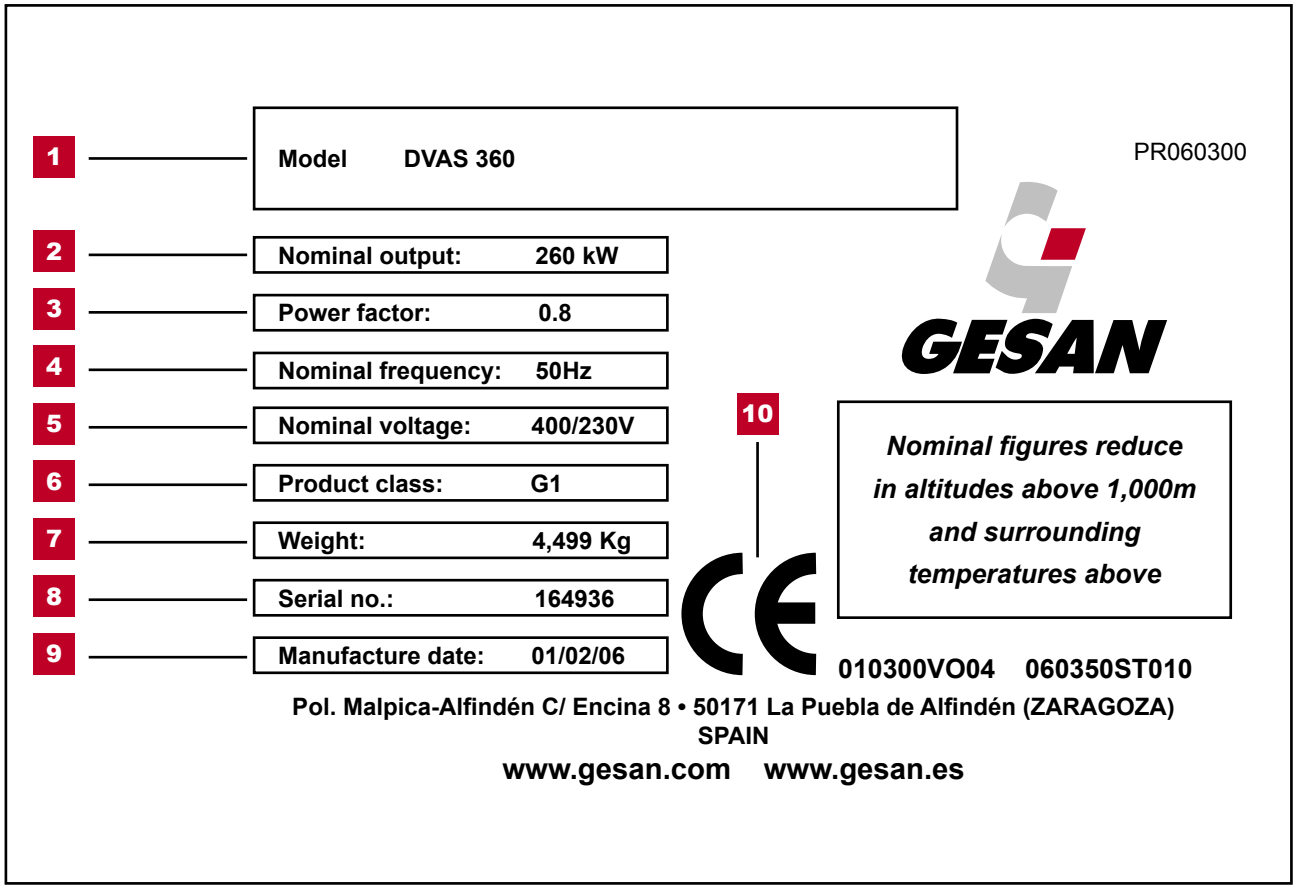


Image 25 - IDENTIFICATION LABEL

NUM	LABELED ITEM	DESCRIPTION
1	DVAS 360 E	D => Engine uses diesel fuel at 1500/1800 rpm
		V => Engine manufacturer is (V)olvo, (P)erkins or (C)ummins
		W => The generator set is designed to operate at 60 Hz
		A => The generator set is automatic
		A => The generator set is soundproofed
		360 => Commercial name
		E => Indicates generator set is emergency type
2	Nominal output	Nominal output of engine expressed in kW
3	Power factor	Indicates power factor of alternator
4	Nominal frequency	Nominal frequency of generator set (Hertz)
5	Nominal voltage	Nominal frequency of generator set (Volts)
6	Product class	When withstanding an overload, engine will perform according to catalogued response times per ISO 8528
7	Weight	Total weight of generator set
8	Serial no.	Serial number of generator manufacture
9	Manufacture date	Manufacture date of generator set
10	CE	CE marking indicates that generator set complies with the relevant directives

IMPORTANT
PLACING IN OPERATION:
1.-Make sure "Battery Shutoff" switch is CLOSED
2.-Check engine's water and oil levels.
3.-Connect earth pin to a suitable point on the ground.
4.-Make sure electrical power circuit breaker is OPEN.
5.-Connect cables to connection terminals on circuit breaker.
6.-Start up ELECTRICAL GENERATOR.
7.-Make sure Voltage and Frequency are correct.
8.-Set Electrical Power switch to CLOSED position.

Image 26 - Placing in operation

CAUTION
THIS GENERATOR SET COULD START UP WITHOUT PRIOR WARNING
To perform MAINTENANCE, turn the BATTERY SHUTOFF SWITCH to the OPEN position.

Image 27 - Caution with generator startup

Image 28 - General warning

Image 29 - Undefined warning notice

Image 30 - Electrical hazard 230 volts

Image 31 - Electrical hazard 400 volts

Image 32 - Lifting point

Image 33 - Possible battery leakage

Image 34 - Electrical grounding

Image 35 - Noise output 90 dB

Image 36 - Noise output 114 dB

Image 37 - Use of hearing protection required

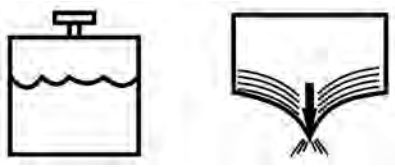


Image 38 - Coolant flush

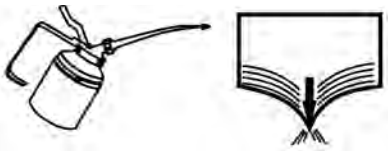


Image 39 - Oil draining

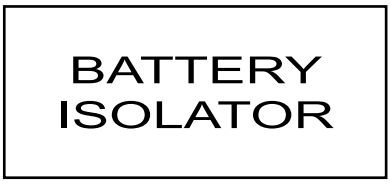


Image 40 - Battery Isolator

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NOTES

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